

APPENDIX A

LIST OF MINE SITE AND MILL CLAIMS

Claim Name	Okanogan County		Amended		BLM ORMC Serial Number
	Book	Page	Book	Page	
GD 3	75	2392	92	598	106383
GD 4	75	2393			106384
GD 5	75	2394			106385
GD 6	92	592			134687
GD 7	75	2395	92	599	106386
GD 8	75	2396			106387
GD 9	75	2397	92	600	106388
GD 11	75	2399	92	601	106390
GD 13	75	2401	92	602	106392
GD 15	75	2403	92	603	106394
GD 17	75	2405	92	604	106396
GD 19	75	2407	92	606	106398
GD 21	75	2409	92	607	106400
GD 23	75	2411	92	608	106402
GD 25	75	2413	92	609	106404
GD 32	77	1408			110084
Tex 6	75	2189			106411
Tex 7	75	2190			106412
Roo 1	75	2204	92	610	106426
Roo 3	75	2206	92	612	106428
Roo 5	92	594			134689
Roo 7	75	2210			106432
Roo 9	75	2212			106434
Roo 12	75	2215			106437
Roo 13	75	2216			106438
Roo 15	85	562			128360
Roo 16	85	564			128361
Roo 18	85	568			128363
Roo 19	85	570			128364
Gap 2	77	2795			109518
Gap 3	77	2797			109519
Gap 4	77	2799			109520
Gap 5	77	2801			109521
Gap 6	77	2803	92	614	109522
MAG 5	92	540			134635
MAG 6	92	541			134636
MAG 7	92	542	155	2819	134637
MAG 8	92	543			134638
MAG 9	92	544	155	2820	134639
MAG 10	92	545			134640
MAG 11	92	546	155	2821	134641
MAG 12	92	547			134642
MAG 13	92	548			134643
MAG 14	92	550			134645
MAG 14 Fraction	92	551			134646
MAG 15	92	552			134647

Claim Name	Okanogan County		Amended		BLM ORMC Serial Number
	Book	Page	Book	Page	
MAG 16	92	553			134648
MAG 17	92	554			134649
MAG 18	92	555			134650
MAG 19	92	556			134651
MAG 20	92	557			134652
MAG 20 Fraction	92	558			134653
MAG 21	92	559			134654
MAG 22	92	560			134655
MAG 23	92	561			134656
MAG 24	92	562			134657
MAG 25	92	563			134658
MAG 26	92	564			134659
MAG 27	92	565			134660
MAG 28	92	566			134661
MAG 29	92	567			134662
MAG 30	92	568	95	3620	134663
MAG 31	92	569	95	3621	134664
MAG 32	92	570	95	3622	134665
MAG 33	92	571	95	3623	134666
MAG 34	92	572	95	3624	134667
MAG 35	92	573	95	3625	134668
MAG 36	92	574	95	3626	134669
MAG 37	92	575	95	3627	134670
MAG 38	92	576	95	3628	134671
MAG 39	92	577	95	3629	134672
MAG 40	92	578	95	3630	134673
MAG 41	92	579	95	3631	134674
MAG 42	92	580	95	3632	134675
MAG 43	92	581			134676
MAG 44	92	582	98	437	134677
MAG 45	92	583	98	438	134678
MAG 46	92	584	98	439	134679
MAG 47	92	585	98	440	134680
MAG 48R	Doc.#	3017475			154996
MAG 49R	Doc.#	3017476			154997
MAG 50	92	588			134683
MAG 51	92	589	95	3633	134684
MAG 52	92	590	95	3634	134685
MAG 53	92	591	95	3635	134686
Katie 1	104	0717			144759
JR 6	123	2568			147550
JR 8	123	2570			147552
JR 9	123	2571			147553
JR 10	123	2572			147554
JR 11	123	2573			147555
JR 12	123	2574			147556

Claim Name	Okanogan County		Amended		BLM ORMC Serial Number
	Book	Page	Book	Page	
JR 13	123	2575			147557
JR 14	123	2576			147558
JR 15	123	2577			147559
JR 16	123	2578			147560
JR 17	123	2579			147561
JR 18	123	2580			147562
JR 19	123	2581			147563
JR 20	123	2582			147564
JR 21	123	2583			147565
JR 22*	123	2584			147566
JR 23*	123	2585			147567
CJ 2	106	1597			145441
CJ 5	106	1600			145444
CJ 6	106	1601			145445
CJ 7	106	1602			145446
CJ 8	106	1603			145447
CJ 9	106	1604			145448
CJ 10	106	1605			145449
CJ 11	106	1606			145450
CJ 12	106	1607			145451
CJ 13	106	1608			145452
CJ 14	106	1609			145453
CJ 15	106	1610			145454
CJ 16	106	1611			145455
CJ 17	106	1612			145456
CJ 18	106	1613			145457
CJ 19	106	1614			145458
CJ 20	106	1615			145459
CJ 21	106	1616			145460
CJ 22	106	1617			145461
CJ 23	106	1618			145462
CJ 24	106	1619			145463
CJ 25	106	1620			145464
CJ 26	106	1621			145465
CJ 27	106	1622			145466
CJ 28	106	1623			145467
CJ 29	106	1624			145468
CJ 30	106	1625			145469
CJ 31	106	1626			145470
CJ 32	106	1627			145471
CJ 33	106	1628			145472
CJ 34	106	1629			145473
CJ 35	106	1630			145474
CJ 36	106	1631			145475
CJ 37	106	1632			145476
CJ 38	106	1633			145477

Claim Name	Okanogan County		Amended		BLM ORMC Serial Number
	Book	Page	Book	Page	
CJ 39	106	1634			145478
CJ 40	106	1635			145479
CJ 41	106	1636			145480
CJ 42	106	1637			145481
CJ 43	106	1638			145482
CJ 45	106	1640			145484
CJ 46	106	1641			145485
CJ 47	106	1642			145486
CJ 48	106	1643			145487
CJ 49	106	1644			145488
CJ 50	106	1645			145489
CJ 51	106	1646			145490
CJ 52	106	1647			145491
CJ 53	106	1648			145492
CJ 54	106	1649			145493
CJ 55	106	1650			145494
CJ 56	106	1651			145495
CJ 57	106	1652			145496
CJ 58	106	1653			145497
CJ 59	106	1654			145498
CJ 60	106	1655			145499
CJ 61	106	1656			145500
CJ 81	106	1676			145520
CJ 103	106	1698			145542
CJ 113	106	2531	123	2720	145552
CJ 116	106	2534			145555
CJ 117	106	2535			145556
CJ 122	Doc.#	3012493			154587
CJ 123	Doc.#	3012494			154588
CJ 124	Doc.#	3012495			154589
CJ 125	Doc.#	3012496			154590
CJ 126	Doc.#	3012497			154591
CJ 127	Doc.#	3012498			154592
CJ 128	Doc.#	3012499			154593
CJ 129	Doc.#	3012500			154594
CJ 130	Doc.#	3012501			154595
CJ 131	Doc.#	3012502			154596
CJ 148	Doc.#	3012511			154605
CJ 149	Doc.#	3012512			154606
CJ 150	Doc.#	3012513			154607
CJ 164	Doc.#	3012527			154621
CJ 165	Doc.#	3012528			154622
CJ 166	Doc.#	3012529			154623
CJ 167	Doc.#	3012530			154624
CJ 176	Doc.#	3012539			154633
ARNO 1	19	259A	77	2859	28800

Claim Name	Okanogan County		Amended		BLM ORMC Serial Number
	Book	Page	Book	Page	
BM #18 Lode	47	1452			66526
BM #19 Lode	47	1453			66527
BM #20 Lode	47	1454			66528
BM #21 Lode	47	1455			66529
BM #22 Lode	47	1456			66530
BM #23 Lode	47	1457			66531
BM #24 Lode	47	1458			66532
BM #25 Lode	47	1459			66533
KG 43 Lode	74	1652			104710
KG 44 Lode	74	1653			104711
KG 45 Lode	74	1654			104712
KG 46 Lode	133	2492			149668
KG 47 Lode	133	2493			149669
KG 48 Lode	133	2494			149670

OWNERSHIP INFORMATION:

Crown Resource Corp. of Colorado
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APPENDIX B

GROUNDWATER MODELLING RESULTS BUCKHORN MOUNTAIN PROJECT

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TECHNICAL MEMORANDUM

TO: Walt Hunt, Vice President of Operations Crown Resources Corporation	DATE: April 24, 2003
FR: Mark Birch, R.G. and David Banton, L.H.G. Golder Associates Inc.	OUR REF: 023-2002.005
RE: GROUNDWATER MODELING RESULTS BUCKHORN MOUNTAIN PROJECT	

1.0 INTRODUCTION

This memorandum summarizes work undertaken representing Phase I of the groundwater modeling task described in Golder Associates Inc.'s letter proposal dated January 31, 2003. The goal of the work described herein is to provide "planning-level" estimates of the potential impacts to the physical groundwater system associated with the proposed underground mining operation on Buckhorn Mountain. Specifically, planning-level estimates are provided for the following:

- Groundwater inflows to the underground workings during mining,
- Change in the location of the groundwater divide between the Myers Creek drainage and the Toroda Creek drainage basins, and
- Final post-closure impacts to the hydrogeological system.

1.1 Scope of Work

The tasks undertaken under Phase I included the following:

- Task I-1 – Summary of geologic and hydrogeologic information and review of existing mine plans and maps,
- Task I-2 – Formulation of the hydrogeologic conceptual model and modeling approach, and
- Task I-3 – SEEP/W Modeling.

From this work, potential impacts to the groundwater system associated with the underground mine plan are assessed and additional work is identified to complete the evaluation of impacts for Environmental Impact Statement (EIS) purposes.

2.0 BACKGROUND AND SETTING

2.1 Conceptual Hydrogeologic Model

2.1.1 Geology and Structure

The orebody is located near the top of Buckhorn Mountain northeast of Chesaw, Washington in Okanogan County (Figure 1). The rocks within the mine area are comprised of Cretaceous- to Tertiary-aged intrusive rocks and Permian- to Triassic-aged, accreted island arc volcanics and clastic sediments. Host rocks for the Buckhorn Mountain mineral deposit consist of a sequence of folded and faulted volcanic and volcanoclastic rocks, shallow to deep marine clastic rocks, and carbonate rocks. Locally, the volcanic rocks overlie sedimentary, carbonate, and volcanoclastic rocks. The sequence has been intruded by numerous small diorite bodies and the larger Buckhorn Mountain granodiorite pluton.

Structurally, rocks in the Buckhorn Mountain area near the deposit average a strike of north-northwest and range in dip from 0 to 20 degrees to the northeast. Northeast-trending, southeast-dipping, and nearly horizontal sinuous healed (low permeability) shear zones locally cut all rock types. Fracture spacings from core logs average 16 to 43 inches (in) (Golder, 1994). These later fractures are generally brittle in nature with limited clay alteration and infilling. The only major structural feature in the immediate site area is the North Lookout Fault zone, which crosses the site from southwest to northeast, dipping 60 to 70 degrees to the southeast (Golder, 1994).

2.1.2 Hydrogeology

The groundwater system in the vicinity of the Buckhorn Mountain project area occurs as three hydrogeologic units: alluvial sediments, glacial deposits, and bedrock. Bedrock is the primary hydrogeologic unit in the immediate project area. Groundwater is present in varying amounts in all bedrock in the mine area. Depths to groundwater are greatest on the ridge tops (generally between 100 and 300 ft below ground surface [bgs] and less in the valley bottoms [less than 50 ft bgs], depending on season). Perennial flow and springs are present in the Gold Bowl drainage at an elevation of approximately 4,900 ft above mean sea level (amsl). Roosevelt Adit is a discharge point for the bedrock unit. Groundwater discharge from the adit was approximately 55 to 60 gallons per minute (gpm) in 1993, a wetter than average year. Average year discharge is estimated to be in the

range of 40 to 45 gpm. Discharge from the adit is lowest in mid-winter in the range of 25 to 30 gpm with greatest discharge in the short spring run-off period of about 100 gpm.

Several years of groundwater level data were collected from wells and boreholes on Buckhorn Mountain by Battle Mountain Gold (BMG) from the early to mid 1990's. Crown Resources personnel reinitiated groundwater level data collection on Buckhorn Mountain in the fall of 2002. These later measurements are tabulated in Table 1. These recent data are consistent with the previously collected data (e.g. Golder, 1994). A water table map has been prepared (Figure 2) based on the measurements taken in November 2002. Groundwater flow direction generally mimics topography as illustrated on Figure 2. Figure 2 also shows the modeled location (Hertzman, 1996) of the groundwater divide along the top of Buckhorn Mountain. This divide separates the Toroda Creek groundwater basin to the east from the Myers Creek groundwater basin to the west

TABLE 1
GROUNDWATER ELEVATIONS

Well ID	Ground Surface Elev. (ft amsl)	September 2002		October 2002		November 2002	
		Depth (ft bgs)	Elev. (ft amsl)	Depth (ft bgs)	Elev. (ft amsl)	Depth (ft bgs)	Elev. (ft amsl)
MW-1	4,131.0	33.2	4,098	33.3	4,098	35.60	4,095
MW-2	4,925.0	273.9	4,651	280.8	4,644	280.60	4,644
MW-3	4,353.5	0.0	4,354	0.0	4,354	0.00	4,354
MW-3A	4,247.7	6.2	4,242	5.8	4,242	5.30	4,242
MW-4	4,044.2	0.0	4,044	0.0	4,044	0.00	4,044
MW-5	4,211.8	7.6	4,204	7.5	4,204	7.40	4,204
MW-6	4,996.4	103.2	4,893	105.1	4,891	105.20	4,891
MW-7	4,253.4	10.0	4,243	9.9	4,244	9.80	4,244
MW-8	3,949.8	23.5	3,926	25.2	3,925	24.30	3,926
MW-9	4,318.7	8.8	4,310	8.7	4,310	8.70	4,310
MW-9A	4,259.1	16.3	4,243	16.6	4,242	17.00	4,242
MW-10	4,741.6	51.2	4,690	51.9	4,690	51.60	4,690
MW-11	4,593.0	na	na	dry 58'	na	Na	na
MW-12	4,684.5	206.5	4,478	206.5	4,478	206.30	4,478
90-238L	5,015.1	118.1	4,897	117.4	4,898	117.6	4,898
90-238U	5,015.1	110.40	4,905	113.4	4,902	113.7	4,901
90-245	5,025.8	149.3	4,877	na	na	Na	na
90-258L	5,100.5	288.8	4,812	287.2	4,813	287.4	4,813
90-258U	5,100.5	143.90	4,957	138.3	4,962	138.3	4,962
90-263	5,028.5	115.3	4,913	118.4	4,910	117.7	4,911
90-272	4,974.6	na	na	66.2	4,908	67.1	4,908
90-303L	5,037.0	58.8	4,978	70.3	4,967	68.1	4,969
90-303U	5,037.0	58.00	4,979	70.0	4,967	67.6	4,969

Well ID	Ground Surface Elev. (ft amsl)	September 2002		October 2002		November 2002	
		Depth (ft bgs)	Elev. (ft amsl)	Depth (ft bgs)	Elev. (ft amsl)	Depth (ft bgs)	Elev. (ft amsl)
90-334L	5,008.4	34.5	4,974	51.0	4,957	48.8	4,960
90-334U	5,008.4	31.40	4,977	50.9	4,958	48.7	4,960
90-355L	5,464.4	na	na	592.7	4,872	Na	na
90-355U	5,464.4	226.50	5,238	226.5	5,238	226.5	5,238
90-356	5,285.6	202.1	5,084	135.2	5,150	135.8	5,150
90-364L	5,158.9	na	na	207.1	4,952	206.8	4,952
90-366	5,292.4	na	na	112.0	5,180	113.7	5,179
90-368L	5,025.1	51.6	4,974	60.2	4,965	56.7	4,968
90-368U	5,025.1	50.10	4,975	58.2	4,967	56.0	4,969
90-371	5,462.2	na	na	423.0	5,039	Na	na
90-386	5,109.4	na	na	366.7	4,743	Na	na
90-387	5,043.4	na	na	227.1	4,816	226.6	4,817
91-443	5,310.2	270.6	5,040	276.5	5,034	275.9	5,034
91-456	5,081.9	190.1	4,892	191.2	4,891	191.1	4,891
92-559	4,547.6	na	na	12.7	4,535	12.3	4,535
D02-176	5,446.0	na	na	467.4	4,979	Na	na
D02-177	5,446.0	na	na	254.9	5,191	255.3	5,191
GAC-188	5,014.7	na	na	122.5	4,892	122.8	4,892
GAC-219	4,961.3	71	4,890	72.3	4,889	72.0	4,889

na = not available

Groundwater flow is via fractures and joints (secondary permeability) in the bedrock rather than within the pore spaces of the rock mass. The fracture systems and joints are influenced by structural episodes of faulting and folding that have affected the ability of the bedrock to store and transmit groundwater. Permeability and porosity are low within the mine area bedrock system. Previous testing has yielded permeability values ranging from 10^{-1} to 10^{-4} feet per day (ft/d). Most permeability values, however range from 10^{-2} to 10^{-3} (ft/d). Testing indicates that groundwater flow in the fractures and joints is similar to that of a porous media on a moderate to large scale. Packer testing was undertaken by Golder (Golder, 1996b) to evaluate the potential permeability of the North Lookout Fault zone in comparison to the neighboring rock mass, and to evaluate permeability as a function of depth. The results indicated that the North Lookout Fault zone is no more permeable than the surrounding rock mass (Golder, 1996b). However, the results indicated that there is a slight decrease in permeability with depth.

Groundwater elevations in the bedrock range from 4,700 to over 5,200 ft amsl (Figure 2). The groundwater levels fluctuate seasonally within the mine area by between 50 and 200 ft in the bedrock

in response to seasonal recharge and discharge. Figure 2 represents seasonally low groundwater conditions as the summer and fall of 2002 were relatively dry. Historical data indicate that groundwater levels rise rapidly in the spring in response to snowmelt and spring runoff. Groundwater elevations subsequently decline over a period of several weeks to months in late spring and early summer, and then decline very slowly throughout the remainder of the year. Aquifer recharge in the immediate site area is via infiltration of precipitation and snowmelt. Previous estimates of groundwater recharge have ranged from 1.9 to 5.4 in per year (in/yr) (Golder, 1996a and 1998; Hertzman, 1996).

2.2 Orebody Development

The underground workings will encompass two distinct ore zones: A Southwest ore zone occurring beneath the ridge area near the top of Buckhorn Mountain and a northern ore zone (referred to as the Gold Bowl ore zone) occurring in the lower elevated terrain to the northeast in the Gold Bowl area. Figure 2 illustrates the location and horizontal extent of the underground workings and ore zones. The Southwest workings will extend to a minimum elevation of 4,835 ft amsl; the Gold Bowl workings will extend to a minimum elevation of 4,475 ft amsl.

Figure 3 shows a view of the proposed access tunnels and ore zones looking down at the workings from the northwest. The Southwest ore zone is shown in green, the Gold Bowl ore zone in red and brown, and the access tunnels in purple and blue. Another view of the ore zones and access tunnels, from the northeast, is shown on Figure 4. The Southwest ore zone is relatively continuous and dips to the southeast at an angle of approximately 20 degrees (Figure 4). The Gold Bowl ore zone consists of a series of small discontinuous zones increasing in depth to the north.

Access to each ore zone will be from the surface via a decline. The portal will be situated at an elevation of approximately 5,030 ft amsl (Figure 2). At this elevation, the decline portal will be above the high water table elevation (Figure 5). The decline will descend and connect to a series of tunnels that will be used to access all of the workings. A perimeter access tunnel will be used to access the Southwest ore zone with a series of spiral declines to access the lower portions of the ore zone. Individual tunnels will be used to access the discontinuous pods of ore associated with the Gold Bowl ore zone.

Mine plans call for backfilling some of the workings as mining proceeds to provide geotechnical support needed to mine the full extent of the orebody and to prevent settlement and surface

disturbance after closure. This approach also has the added benefit of minimizing aboveground disturbance by disposing of the barren rock below ground. Both cemented backfill and uncemented backfill will be used.

2.3 General Description of Groundwater Conditions

Much of the mine workings will extend below the water table, and as a consequence, groundwater will enter the workings as mining proceeds. Figure 5 shows the portion of the proposed workings that are above and below the November 2002 water table. Because groundwater levels are higher in the spring (by as much as 50 to 200 ft), a greater proportion of the orebody will be below the water table. As shown on Figure 5, the upper westernmost portion of the Southwest orebody is above the November 2002 water table as well as the upper levels of the Gold Bowl orebody workings.

Groundwater that enters the workings will be removed along with the ore and waste rock, and by sumps as needed. The quantity of groundwater that will flow into the workings will depend on a number of operational factors (e.g., rate of mining, the geometry and scheduling of mining in different areas, and backfilling program). Groundwater flow into the workings will increase as mining proceeds with the maximum inflows at the end of mining when the orebody is fully developed. For the purposes of providing a simplified basis for modeling, the worst-case assumption is that at the end of the mine life all of the workings remain fully open (no backfill) and that all groundwater entering the workings is removed by pumping. Under this simplified worst-case condition, the quantity of groundwater inflow would depend on three primary factors:

- The permeability of the surrounding rock,
- The amount of water stored in the rock, and
- The size of the groundwater recharge area within the capture zone (upgradient) of the workings.

The first two factors apply in nearly all underground mining operations. However, the third factor is of unique importance in this particular case because the orebody is located near the top of Buckhorn Mountain, the highest topographic feature within a radius of approximately 10 miles. As a consequence, the amount of groundwater that can flow into the workings is limited because the capture zone of the pit is restricted to the upper elevations of the mountain (Figures 1 and 2). During mining, the Southwest zone workings will intercept some of the upgradient recharge east of the groundwater divide (Figure 2). In addition, it is possible that drawdown in the vicinity of the

Southwest workings will result in a migration of the groundwater divide to the west, effectively capturing some of the groundwater recharge that would otherwise feed the Myers Creek groundwater basin to the west. Modeling results discussed in the following section illustrate the possible quantity of groundwater recharge that could be captured by the workings as well as the potential migration westward of the groundwater divide.

3.0 GROUNDWATER MODELING

Groundwater inflows into the underground workings will depend on a number of operational issues in addition to the hydrogeologic conditions at the site. For modeling purposes, these operational issues are ignored. Three conditions were modeled in this analysis; current conditions and two conditions where the final mine is either backfilled or not. The focus is placed on estimating worst-case conditions from the perspective of impacts to groundwater resources. Worst-case conditions would occur after the hydrogeologic system has fully adjusted to mine dewatering, or when "steady-state" conditions are attained assuming that the water is consumed (i.e., not treated and discharged to the environment). Under steady-state conditions, the only source of groundwater inflows to the workings would be from recharge occurring within the capture zone of the workings.

Reviewing the geometry of the planned underground workings (Figures 3 and 4), the Southwest orebody workings will have an effect on the regional groundwater divide between the Toroda and Myers Creek basins because the orebody straddles the topographic divide. As shown on Figure 2, the Southwest orebody physically extends westward across the modeled groundwater divide (Hertzman, 1996), although the orebody is above the water table in much of this area (Figure 5). Groundwater inflows are likely to be greater into the Gold Bowl workings because they are located downgradient of a larger groundwater catchment area than the Southwest orebody workings. To evaluate the potential impacts of the Southwest orebody on groundwater flow and inflow rates, a cross-sectional groundwater flow model was constructed at the location shown on Figures 1 and 2. A commercially available, variably saturated groundwater flow modeling software package called SEEP/W (GEO-SLOPE, 2002) was used. The geometry of the cross-sectional model and assigned boundary conditions is shown on Figure 6. Figure 6 illustrates several hydraulic conductivity layers, each measuring 100 ft thick. The layers were assigned slightly decreasing hydraulic conductivity with depth consistent with the packer testing results, and that was incorporated into previous modeling efforts (Golder, 1996a). Three steady-state simulations were run as follows:

- Case A – Pre-mining Condition - representing the current conditions,
- Case B – End of Mining Condition - representing worst-case conditions at the end of mining assuming the workings are not backfilled, and
- Case C – Post-closure Condition - representing a generic, final post-closure condition with a continuous but moderately permeable backfill. No discharge from the mine to the surface as the decline portal would be located above the maximum high water table elevation.

As shown on Figure 6, the underground workings under Case B were represented as an open void that approximates the orebody geometry with a seepage face boundary condition assigned to its perimeter. For Case C, the void was assumed to be backfilled with material ranging in hydraulic conductivity from 1.8×10^{-3} ft/d around the outer perimeter to 8.1×10^{-4} ft/d in the interior (needed for numerical stability purposes), and the seepage face boundary condition was removed. A no-flow boundary condition was assigned along the bottom of the model area in all cases at a depth of 800 ft bgs, representing the depth at which flow is assumed to be extinguished due to low permeability. Other key assumptions and assigned model parameter values for the SEEP/W modeling are summarized in Table 2.

The approach to modeling used here was to extend and update previous SEEP/W modeling work (Golder, 1996a) to incorporate the new underground mining plan, including using an assumed recharge rate of 1.9 in/yr consistent with the previous modeling effort performed by Golder. Calculated inflows and associated impacts are then extrapolated to the range of recharge estimates consistent with Hertzman (1996) and Golder (1998) to provide a range of possible impacts based on the uncertainty associated with recharge estimates.

This approach is reasonable based on previous modeling (Golder, 1996a; Hertzman, 1996), which indicates that impacts are directly proportional to the assumed recharge (e.g., the modeled capture zone area remains approximately the same, regardless of assumed recharge value). In comparison to the 800-ft aquifer thickness assumed in the SEEP/W model, Hertzman (1996) assumed an aquifer thickness of 1,000 ft. However, as part of the sensitivity analysis undertaken by Hertzman, the results are relatively insensitive to assumed aquifer thickness. Hydraulic conductivity values used here (Table 2) are consistent with the values used by Hertzman (8×10^{-3} to 2.2×10^{-3} ft/d in the general region of the cross-section). However, Hertzman used two layers (upper 200-ft thick and lower 800-ft thick), instead of Golder's eight layers (in part necessary for numerical reasons as Hertzman's model was a plan view model of regional expanse).

The Case A – Pre-mining Condition model was calibrated to the November 2002 groundwater elevations measured at the monitoring wells, and then the calibrated hydrogeologic parameters were subsequently used to model the other two cases. A limited sensitivity analysis was undertaken to evaluate the appropriateness of the assigned boundary conditions; however, a detailed sensitivity analysis was considered beyond the scope of this preliminary phase.

TABLE 2
MODEL PARAMETERS AND ASSUMPTIONS

Parameter	Value
Boundary Conditions	
Recharge	1.9 in/yr
East Constant Head (CH)	4,292 ft amsl
West Constant Head (CH)	3,975 ft amsl
West Seepage Face (review boundary)	3,900 ft length (variable discharge depending on calculated heads)
East Seepage Face (review boundary)	1,200 ft length (variable discharge depending on calculated heads)
Layer (saturated) Hydraulic Conductivity (from top to bottom)*	
Backfill (Case C only)	1.8×10^{-3} to 8.1×10^{-4} ft/d
Layer 1	5×10^{-2} ft/d
Layer 2	8×10^{-3} ft/d
Layer 3	5.2×10^{-3} ft/d
Layer 4	3.8×10^{-3} ft/d
Layer 5	2.6×10^{-3} ft/d
Layer 6	1.8×10^{-3} ft/d
Layer 7	1.2×10^{-3} ft/d
Layer 8	8.1×10^{-4} ft/d

* each layer 100 ft thick

3.1 Modeling Results

Model results are shown on Figures 7 through 9 and are briefly described as follows:

- Case A – Pre-mining Condition (Figure 7)
 - The groundwater level conditions (measured in November 2002) were matched reasonably well using bedrock hydraulic conductivity properties (Table 2) similar to those employed in Golder (1996b) and an assumed recharge rate of 1.9 in/yr.
 - The modeled regional groundwater divide is located approximately 200 ft west of the topographic divide (Figure 7), which contrasts with the

previously estimated location of the regional groundwater divide approximately 300 ft farther to the west (Hertzman, 1996). This disparity is associated with the asymmetric geometry of the ground surface of Buckhorn Mountain. Asymmetry in the ground surface geometry in turn results in a groundwater divide location that does not fall directly beneath the topographic divide in this area. Cross sectional modeling can represent asymmetric geometries along the plane of the modeled cross section. However, cross sectional modeling cannot accurately reflect water level conditions resulting from changes in the ground surface geometry perpendicular to the plane of the model.

- Case B – End of Mining Condition (Figure 8)
 - Simulation of the post-mining ultimate configuration of the Southwest workings suggests that the workings will capture most of the recharge that occurs at land surface above the workings, but that the capture zone of the workings does not extend much beyond the surface projection of the workings (Figure 8). Recharge captured by the workings includes approximately 555 ft west and 700 ft east of the Case A pre-mining groundwater divide location along the trace of the cross section. Given that the Southwest orebody extends roughly 900 ft from north to south (Figure 2), and that the capture zone of the workings does not extend beyond the surface projection of the workings (based on the preliminary modeling results), the capture zone area of the Southwest workings equates to a total of 26 acres. Of this total, 11.5 and 14.5 acres are projected to lie within the Myers Creek and Toroda Creek groundwater basins, respectively, based on the Case A modeled regional groundwater divide location. As shown on Figure 8, the capture zone of the workings extends approximately 250 ft west of the previously estimated location of the regional groundwater divide (Hertzman, 1996). This equates to an approximate recharge area west of this regional groundwater divide location of 5.2 acres.
 - Given the assumed recharge rate used in the model (1.9 in/yr) and estimated capture zone of 26 acres, the total average inflow into the Southwest workings would be roughly 2.6 gpm. Capture of this groundwater recharge would in turn reduce groundwater discharge to the west and east of the Case A regional groundwater divide location respectively by 1.1 gpm, and 1.4 gpm. 0.5 gpm of the total of 1.1 gpm reduced recharge to Myers Creek drainage, occurs from capturing recharge west of the previously estimated regional groundwater divide location.
- Case C – Post-closure Condition (Figure 9)
 - Simulation of the post-closure condition of the Southwest workings assuming backfill with modestly permeable material (1.8×10^{-3} to 8.1×10^{-4} ft/d) and no direct discharge to surface from the mine workings suggests that there could be a long-term displacement from the Case A regional groundwater divide to the west by a very small amount (approximately 20 ft). This equates to a loss of recharge area of approximately 0.4 acres from the Myers Creek basin and a gain of an equivalent area to the Toroda Creek basin. The resulting theoretical reduction in groundwater recharge would be approximately

0.04 gpm to the Myers Creek basin and an equivalent gain to the Toroda Creek basin. Note, as shown on Figure 9, however, that the Case C modeled shift in the divide falls east of the previously modeled regional groundwater divide location (Hertzman, 1996). Therefore, assuming Hertzman's groundwater divide, there would be no recharge captured from the Myers Creek basin following closure.

As noted above, there is a disparity between the previously modeled regional groundwater divide location and the regional groundwater divide location calculated using the cross sectional model. The previous groundwater divide location was computed using a regional plan view quasi-three dimensional groundwater model (Hertzman, 1996), that can more accurately account for the asymmetric geometry of Buckhorn Mountain. Therefore, the previous estimated regional groundwater divide location is believed to be more accurate than the Case A regional groundwater divide location. Consequently, the resulting shift in the regional groundwater divide and associated impacts on the Myers Creek basin described in this report should be viewed as conservative over estimates.

It should also be noted that the estimated inflows to the Southwest orebody workings and associated impacts on the water resources of the Buckhorn Mountain area described above are based on an assumed average groundwater recharge rate of 1.9 in/yr. However, the actual average annual groundwater recharge rate on Buckhorn Mountain is uncertain because of inherent measurement limitations and climatic variability at the site. Previous estimates of recharge range from 1.9 in/yr (Golder, 1996) to 4.5 in/yr (Golder, 1998), to between 2.5 and 5.4 in/yr (Hertzman, 1996). Recognizing this uncertainty, Table 3 presents estimated groundwater inflows associated with the Southwest orebody, based on the modeling results described above and the range of estimated recharge values that have been previously developed.

Assuming the maximum estimated recharge rate of 5.4 in/yr, for example, total estimated inflows to the Southwest workings are calculated at 7.3 gpm at the end of mining (Case B). A portion of this inflow (3.2 gpm) is derived from the Myers Creek groundwater basin as a result of the projected shift in the Case A groundwater divide. Following closure, there will be no consumptive withdrawals of groundwater. However, the projected permanent shift from the Case A groundwater divide of 20 ft results in diverting 0.12 gpm from Myers Creek drainage into the Toroda Creek drainage, under the assumed maximum recharge of 5.4 in/yr.

TABLE 3
ESTIMATED GROUNDWATER INFLOWS TO UNDERGROUND WORKINGS

Modeling Case		Groundwater Recharge Capture Area (acres)	Assumed Recharge Rate (in/yr)**				
Case B - End of Mining Condition	MINE INFLOWS	(acres)	1.9	2.5	3.7	4.5	5.4
			Inflow Rate (gpm)				
	Southwest Workings	26	2.6	3.4	5	6	7.3
	Northwest Workings	124	12.2	16	23.7	28.8	34.6
	<i>Total</i>	<i>150</i>	<i>14.7</i>	<i>19.4</i>	<i>28.7</i>	<i>34.9</i>	<i>41.8</i>
	SOURCE OF INFLOWS						
	Southwest Workings		Inflow Rate (gpm)				
	Myers Creek Drainage	11.5	1.1	1.5	2.2	2.7	3.2
	Toroda Creek Drainage	14.5	1.4	1.9	2.8	3.4	4.0
	Gold Bowl Workings						
	Myers Creek Drainage	0	0.0	0.0	0.0	0.0	0.0
	Toroda Creek Drainage	124	12.2	16.0	23.7	28.8	34.6
	Total						
	<i>Myers Creek Drainage</i>	<i>11.5</i>	<i>1.1</i>	<i>1.5</i>	<i>2.2</i>	<i>2.7</i>	<i>3.2</i>
	<i>Toroda Creek Drainage</i>	<i>138.5</i>	<i>13.6</i>	<i>17.9</i>	<i>26.5</i>	<i>32.2</i>	<i>38.6</i>
Case C - Post Closure Condition	Mine Inflows						
	Southern Workings	0	0	0	0	0	0
	Northern Workings	0	0	0	0	0	0
	<i>Total</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>
	SOURCE OF WATER						
	Southwest Workings		Flow Rate (gpm)				
	Myers Creek Drainage	-0.42	-0.04	-0.05	-0.08	-0.10	-0.12
	Toroda Creek Drainage	0.42	0.04	0.05	0.08	0.1	0.12
	Gold Bowl Workings						
	Myers Creek Drainage	0	0.0	0.0	0.0	0.0	0.0
	Toroda Creek Drainage	0	0.0	0.0	0.0	0.0	0.0
	Total						
	<i>Myers Creek Drainage</i>	<i>-0.42</i>	<i>-0.04</i>	<i>-0.05</i>	<i>-0.08</i>	<i>-0.10</i>	<i>-0.12</i>
	<i>Toroda Creek Drainage</i>	<i>0.42</i>	<i>0.04</i>	<i>0.05</i>	<i>0.08</i>	<i>0.1</i>	<i>0.12</i>

Negative values indicate consumptive withdrawals or diversion

* Estimated groundwater divide shift impacts are conservative overestimates, given that impacts are based on shifts west of the Case A modeled groundwater divide instead of the more realistic groundwater divide location approximately farther to the west (based on Hertzman, 1996 divide location).

** Estimates from various sources (Golder, 1996 and 1998; Hertzman, 1996)

The modeling results discussion thus far has focused only on the Southwest workings. Table 3 further shows estimated inflows to the Gold Bowl workings and total combined inflows, along with

estimated quantities of groundwater recharge that would be intercepted from (or diverted to) the Myers Creek and Toroda Creek groundwater basins for Cases B and C. Given the modeling results described above for the Southwest workings in combination with the geometry and location of the proposed underground workings in the Gold Bowl ore zone area (in the Gold Bowl area), there will be no shift in the groundwater divide in the northern area. Consequently, reduced groundwater recharge in the Myers Creek drainage is projected only for the south fork of Bolster Creek (Figure 1) in association with impacts from the Southwest workings. For comparison, permanent post-closure reductions in groundwater recharge were predicted for both the south and north forks of Bolster Creek and Gold Creek for the previously proposed open pit mine.

The modeling results from the Southwest workings cannot be readily extrapolated to the Gold Bowl workings because of the limited nature of the underground development in this area. To develop a conservative estimate of inflows to the Gold Bowl workings we estimated that the capture zone of the Gold Bowl workings to be 124 acres based on the groundwater table configuration in relation to the orebody.

Figure 10 shows the estimated capture zone of the Southwest workings along with the equivalent capture zone area calculated for the Gold Bowl workings. The assumption is made that all recharge upgradient of the workings westward to the groundwater divide will be captured, as well as recharge occurring a limited distance to the east (a minimum distance of 250 ft is assumed). In reality, in contrast to the previous open pit configuration, it is likely that some of the recharge will bypass the workings due to their sporadic discontinuous nature and discharge to the east.

As shown in Table 3, total inflows into the workings during mining are postulated to be from 14.7 to 41.8 gpm, based on the range of estimated recharge values and the assumptions described above. Nearly all of this groundwater would be from recharge intercepted within the Toroda Creek drainage during mining. Following closure, there would be no interception of groundwater. However, the projected permanent shift in the Case A regional groundwater divide results in a projected permanent diversion of groundwater from Myers Creek drainage into the Toroda Creek drainage ranging from 0.04 gpm to 0.12 gpm. By comparison, post-closure reduction in baseflows to the Myers Creek drainage for the previously proposed open pit mine was estimated at 6.5 gpm (Golder, 1998).

During mining, it is reasonable to assume that Roosevelt Adit discharges will be reduced in response to upgradient capture by the workings. As a worst-case, one could assume that the Roosevelt Adit discharges will be reduced by the total amount intercepted by the proposed Southwest workings of the

underground mine (3 to 7.5 gpm). For comparison, the Hertzman model estimated the potential impact of the open pit on Roosevelt adit flows of 22 gpm.

It should be noted that the above results are preliminary in nature, and that the model has not been subjected to intensive sensitivity analysis. Further, the results are based on a simplified two-dimensional representation of a three-dimensional system. The results, however, are consistent with what would be expected when compared to previous estimated impacts associated with an open pit configuration (e.g., Hertzman, 1996; Golder, 1998).

From an operational perspective, it is important to note that short-duration inflows to both the Gold Bowl and Southeast workings could be substantially higher than the long-term sustainable inflows described above, depending on the drainable porosity of the rock in the vicinity of the workings. The overall drainable porosity is limited, only a few percent. However, it can vary significantly locally leading to greater short-duration inflows such as when an open fault or fracture system is initially encountered. From groundwater level data, nearly all of the annual recharge on Buckhorn Mountain takes place during a short period of time coinciding with spring snow melt. Groundwater levels measured in monitoring wells and piezometers indicate that the effects of recharge are transmitted rapidly (on the order of weeks) through the system (e.g. discharges downgradient). As a result, most of the annual inflows to the workings would likely occur over a short period in the late spring and early summer.

4.0 DISCUSSION

The results illustrate that potential inflows to the underground workings and the displacement of the groundwater divide associated with the proposed mining operation during and after mining will be minimal.

To put the effects of the displacement of the regional groundwater divide at the end of mining into perspective, assume for discussion purposes that the groundwater recharge is reduced in the south Fork of Bolster Creek by the conservatively overestimated amount of 3.2 gpm, or 4,600 gpd at the end of mining (Case B). For comparison, a single exempt well may consume up to 5,000 gpd. For practical purposes, measurement and verification of such small theoretical impacts is impossible. Further, the estimated level of impacts is approaching the level of precision that is technically feasible given the inherent uncertainty in hydrogeologic conditions and natural climatic variability. Recharge,

for example, will vary considerably from one year to the next depending on the amount and timing of precipitation and snow melt events, antecedent moisture conditions, temperature, etc.

It should be further noted that the impacts will progress during the period of mining and reach a maximum at the end of the mine life. Impacts would subsequently subside over a similar time frame and reach a final post-closure steady state condition.

5.0 CONCLUSIONS

We believe that the analysis presented here covers the potential range of groundwater flow into the underground workings and the potential displacement in the regional groundwater divide between the two basins, given the inherent uncertainty in hydrogeologic conditions and natural climatic variability. Consequently, the potential impacts estimated through the use of the two-dimensional groundwater model are believed to be adequate for EIS purposes, subject to further model sensitivity and verification.

REFERENCES

- GEO-SLOPE International, Ltd., 2002. SEEP/W Define Version 5.13. Calgary, Alberta, Canada.
- Golder Associates Inc. (Golder), 1994. *Report on Inflows to Crown Jewel Pit*. Report to Battle Mountain Gold Company. September 2, 1994.
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- Golder Associates Inc., 1996b. *Report on Packer Injection Tests at the Proposed Crown Jewel Mine, Okanogan County, Washington..* Report to Battle Mountain Gold Company. May 8, 1996.
- Golder Associates Inc., 1998. *Crown Jewel Mine Streamflow Mitigation Plan*. Report to Battle Mountain Gold Company. November 11, 1998.
- Hertzman, R., 1996. *Numerical Simulation for Ground Water Flow Near the Proposed Crown Jewel Mine*. Report to Hydro-Geo Consultants, Inc. April 28, 1996.

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APPENDIX C

MATERIAL SAFETY DATA SHEETS FOR CHEMICAL CONSUMABLES

MATERIAL SAFETY DATA SHEET



GREAT WESTERN CHEMICAL COMPANY

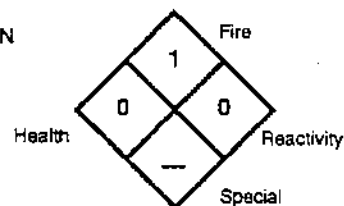
ISSUE DATE: 04/23/97

SUPERSEDES: 12/14/94

GREAT WESTERN MSDS NUMBER: 98968

NFPA 704 DESIGNATION
HAZARD RATING

4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Insignificant



1. CHEMICAL PRODUCT IDENTIFICATION & COMPANY IDENTIFICATION

PRODUCT IDENTIFIER: **METASORB CARBON** GRADES: 321G, 321GS, 331GS, 351G, 351GS, 361GS

GENERAL USE: This product is used for industrial decolorization, separation, and filtration applications.

PRODUCT DESCRIPTION: Product is a steam activated carbon produced from coco shell fibers.

INFORMATION PROVIDED BY: GREAT WESTERN CHEMICAL COMPANY
Corporate Office
808 S.W. 15th Avenue
Portland, OR 97205
PHONE: 503-228-2600 FAX: 503-221-5767

EMERGENCY PHONE NUMBERS

GREAT WESTERN: 800-497-7455
CHEMTREC: 800-424-9300
CANUTEC: 613-996-6666

2. COMPOSITION & INFORMATION ON INGREDIENTS

COMPONENT	CAS #	OSHA HAZARD	Wt. %	ACGIH		OSHA	
				TLV (TWA)	STEL	PEL (TWA)	STEL
Carbon	007440-44-0	Mild Eye, Skin and Respiratory Irritant	100	10 mg/m ³	None	15 mg/m ³	None
				(inhalable particulate)		(total dust)	
				3 mg/m ³		5 mg/m ³	
				(respirable particulate)		(respirable fraction)	

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

A powdery, granular, black solid with no characteristic odor. Dust may cause mild irritation to eyes, skin and respiratory tract. This product is practically non-toxic by ingestion.

POTENTIAL HEALTH EFFECTS:

INHALATION: Exposure to dust may cause mild respiratory tract irritation. Symptoms of exposure may include: coughing, chest discomfort and shortness of breath.

EYE CONTACT: Exposure to dust may cause mild eye irritation. Symptoms of exposure may include: redness, itching and a stinging sensation. Exposure is not expected to cause corneal damage or visual impairment.

SKIN CONTACT: Exposure to dust may cause mild skin irritation. Symptoms of exposure may include: redness and itching. No published reports indicate this product is absorbed through the skin.

INGESTION: Ingestion may cause mild gastrointestinal irritation. Symptoms of exposure may include: headache and weakness.

CHRONIC: Prolonged or repeated eye exposure to dust may cause conjunctivitis. No other chronic health effects have been reported.

CONTINUED ON PAGE 2

4. FIRST AID MEASURES

- INHALATION:** If inhaled, immediately move to fresh air. If not breathing, give artificial respiration. Use the mouth-to-mouth method. If breathing is difficult, give oxygen. Call a physician.
- EYE CONTACT:** In case of contact, immediately flush eyes with plenty of clean running water for at least 15 minutes, lifting the upper and lower lids occasionally. Remove contact lenses, if worn. Get medical attention if irritation persists.
- SKIN CONTACT:** In case of contact, cleanse affected area thoroughly by washing with mild soap and water. Remove contaminated clothing and shoes. If irritation occurs and persists, get medical attention.
- INGESTION:** If swallowed, give plenty of water to drink. Call a physician. **DO NOT** induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person.
- NOTE TO PHYSICIANS:** This product may produce mild irritation of mucous membranes. Treat exposure symptomatically.

5. FIRE FIGHTING MEASURES

- Flashpoint and Method:** Product does not flash.
- Flammable Limits** (In air, % by volume): **Lower:** Not applicable **Upper:** Not applicable
- Autoignition Temperature:** About 450 °C (842 °F)
- GENERAL HAZARD:** This material can be ignited at elevated temperatures and will burn. Wet activated carbon removes oxygen from the air causing a severe hazard inside enclosed or confined spaces. Product may produce hazardous fumes or hazardous decomposition products.
- FIRE FIGHTING INSTRUCTIONS:** **EXTINGUISHING MEDIA:** Water, CO₂, sand or dry chemicals.
Use extinguishing media appropriate to surrounding fire.
- FIRE FIGHTING EQUIPMENT:** Fire fighters should wear full protective equipment, including self-contained breathing apparatus.
- HAZARDOUS COMBUSTION PRODUCTS:** Thermal decomposition will produce carbon monoxide and carbon dioxide.

6. ACCIDENTAL RELEASE MEASURES

- LAND SPILL:** Wearing recommended protective clothing, scoop up spilled material and containerize for recovery or disposal. Flush spill area with water, collect rinsates and containerize for disposal. Prevent run-off from contaminating sewers, streams or other bodies of water.
- WATER SPILL:** Wear protective equipment and clothing if contact with hazardous material can occur. Stop or divert water flow. Dike contaminated water and remove for disposal and/or treatment. As appropriate, notify all downstream users of possible contamination.

7. HANDLING AND STORAGE**STORAGE TEMPERATURE:** Ambient**STORAGE PRESSURE:** Ambient**GENERAL:**

Store in a cool, dry area away from incompatible material. Avoid breathing dust. Use only with adequate ventilation. Protect eyes, skin, and clothing from contact with product. Wear recommended protective equipment. Wash thoroughly after handling.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

CONTROL MEASURES: Use local mechanical exhaust ventilation capable of maintaining dust levels in the work area below the ACGIH-TLV or OSHA-PEL for nuisance and total dust.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT:

RESPIRATOR: If use causes dusting a dust mask is recommended. If the ACGIH-TLV or OSHA-PEL for nuisance or total dust is exceeded, wear a NIOSH-approved half mask air-purifying cartridge respirator equipped with a particulate filter cartridge or supplied air.

EYES: Wear safety glasses with side shields. If dust levels are irritating, use chemical goggles (recommended by ANSI Z87.1-1979).

GLOVES: Rubber gloves.

CLOTHING & EQUIPMENT: Wear a long-sleeved shirt or overalls when handling product. An eyewash station should be available in the work area.

FOOTWEAR: Normal work boots.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Powdery, granular, black	Bulk Density (pounds/ft³):	24 to 28
Physical State:	Solid	Vapor Pressure:	Not applicable
Odor:	None	Vapor Density (air=1):	Not applicable
Odor Threshold:	No data available	Evaporation Rate (n-Butyl Acetate=1):	Not applicable
Molecular Formula:	Atomic formula: C	VOC Content:	Not applicable
Molecular Weight:	Atomic weight: 12.011	% Volatile:	Nil
Boiling Point:	Approximately 4,200 °C (sublimes)	Solubility in H₂O:	Negligible
Freezing/Melting Point:	No data available	Octanol/Water Partition Coefficient:	No data available
Specific Gravity:	0.41 to 0.51 @ 20 °C	pH (as is):	Not applicable
Density (pounds/gallon):	Not applicable	pH (1% solution):	Not applicable

10. STABILITY AND REACTIVITY

GENERAL: This product is stable and hazardous polymerization will not occur.

CONDITIONS TO AVOID: None known.

INCOMPATIBLE MATERIAL: Strong oxidizers and oxygenated organic compounds.

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition produces toxic oxides of carbon.

SENSITIVITY TO MECHANICAL IMPACT: This product is not sensitive to mechanical impact.

SENSITIVITY TO STATIC DISCHARGE: This product is not sensitive to static discharge.

11. TOXICOLOGICAL INFORMATION

Components:	<u>Carbon</u>
Eye Contact:	No data available
Skin Contact:	No data available
Oral Rat LD₅₀:	No data available
Dermal Rabbit LD₅₀:	No data available
Inhalation Rat LC₅₀:	No data available
Human Data:	No data available
Other Toxicological Data:	Intravenous Mouse LD ₅₀ : 440 mg/kg
Carcinogenicity:	No data available
Teratogenicity:	Subcutaneous Rat TDLo: 167 mg/kg
Mutagenicity:	No data available
Synergistic Products:	No data available
Target Organs:	Eyes, Skin & Lungs
Medical Conditions	Chronic respiratory diseases
Aggravated by Exposure:	

12. ECOLOGICAL INFORMATION**ENVIRONMENTAL FATE:**

No specific environmental fate data available.

ENVIRONMENTAL EFFECTS:

Aquatic toxicity information is not available.

13. DISPOSAL CONSIDERATIONS**RCRA 40 CFR 261 CLASSIFICATION:** Not applicable**U.S. EPA WASTE NUMBER/DESCRIPTION:** None

If this product is disposed of as shipped, it does not meet the criteria of a hazardous waste as defined under 40 CFR 261, in that it does not exhibit the characteristics of hazardous waste of Subpart C, nor is it listed as a hazardous waste under Subpart D. As a non-hazardous solid waste, it should be disposed of in accordance with all local, state and federal regulations. Consult state or local officials for proper disposal method.

14. TRANSPORTATION INFORMATION**DOT PROPER SHIPPING NAME:** Not Restricted**DOT HAZARD CLASS:** None**UN NUMBER:** None**PACKING GROUP:** None**DOT LABELS:** Primary: None Required

Subsidiary: None Required

DOT PLACARDS: None Required**CERCLA Reportable Quantity:** None**MARINE POLLUTANT:** No**DOT 1993 Emergency Response Guidebook No.:** None**DOT 1996 North American Emergency Response Guidebook No.:** None**TDG PROPER SHIPPING NAME:** Not Restricted**TDG HAZARD CLASS:** None Regulated Limit (RL): Not Applicable**UN NUMBER:** None**PACKING GROUP:** None**TDG LABELS:** Primary: None Required

Subsidiary: None Required

TDG PLACARDS: None Required**CANUTEC Initial Emergency Response Guide Number:** None**Other Shipping Information:** None.

15. REGULATORY INFORMATION**COMPONENTS:** Carbon**OSHA****Target Organs:** Eyes, Skin & Lungs**Carcinogenic Potential:**

Regulated by OSHA: No

Listed on NTP Report: No

IARC Listing: No

U.S. EPA Requirements**Release Reporting****CERCLA (40 CFR 302):****Listed Substance:** Not listed

Reportable Quantity: Not applicable

Category: Not applicable

RCRA Waste No.: Not applicable

Unlisted Substance: Not applicable

Reportable Quantity: Not applicable

Characteristic: Not applicable

RCRA Waste No.: Not applicable

SARA TITLE III**Section 302 & 303 (40 CFR 355)****Listed Substance:** Not listed

Reportable Quantity: Not applicable

Planning Threshold: Not applicable

Section 311 & 312 (40 CFR 370)Hazard Categories (product): **Fire:** N **Sudden Release of Pressure:** N **Reactive:** N **Acute Health:** Y **Chronic Health:** N

Planning Threshold: 10,000 pounds

Section 313 (40 CFR 372)**Listed Toxic Chemical:** Not listed

Reporting Threshold: Not applicable

U.S. TSCA STATUS**Listed (40 CFR 710):** Yes**CANADIAN REGULATIONS****Controlled Product:** No**WHMIS Hazard Symbols:** Non-controlled**WHMIS Class & Division:** Not applicable**Product Identification Number:** None**IDL Substance:** Not listed**Domestic Substance List:** Yes**CEPA Priority List:** Not listed**Carcinogenicity:**

ACGIH Appendix A: No

A1 Confirmed Human: No

A2 Suspected Human: No

IARC Group: Not listed

STATE REGULATIONS:**State of California****Safe Drinking Water and Toxins Enforcement Act, 1986 (Proposition 65)****Carcinogen:** Not listed**Reproductive Toxin:** Not listed**OTHER REGULATIONS:****State Right To Know Laws:** Not listed

16. OTHER INFORMATION

EPA Registration number: Not Applicable
Approved Product Uses: Not Applicable

Special Notes:**Shipping Information:**

This product does not meet the definition of a spontaneously combustible material as defined in Department of Transportation regulations (49 CFR 173.124).

This product does not meet the definition or the required test procedure for a pyrophoric material per 49 CFR 3.a.(1) Appendix E.

This product does not meet the definition or the required test procedure for a self-heating material per 49 CFR 3.b.(1) of appendix E.

This product is exempt from Transportation of Dangerous Goods regulations per 2.3(a)(viii)(B).

Warning: Wet activated carbon removes oxygen from the air causing a severe hazard to workers inside carbon vessels and enclosed or confined spaces. Before entering such an area, sampling and work procedures for low oxygen levels should be taken to ensure ample oxygen availability. For proper tank entry procedures, see ANSI Z117-1-1977.

MSDS Revision Information:

Form Revision made 02/09/94

Information Revised This Issue Date: **Updated physical data, section 9.**

MSDS distributed by **Great Western Chemical Company**
Environmental Department
Phone: 800-547-1400 FAX: 503-221-5767

Prepared By:

Becca Heartwell

Date Prepared:

April 23, 1997

This Material Safety Data Sheet is provided as an information resource only. It should not be taken as a warranty or representation for which Great Western Chemical Company assumes legal responsibility. While Great Western Chemical Company believes the information contained herein is accurate and compiled from sources believed to be reliable, it is the responsibility of the user to investigate and verify its validity. The buyer assumes all responsibility of using and handling the product in accordance with applicable federal, state, and local regulations.

☒ The
Hummel
Croton
Web
Page

HUMMEL CROTON INC.

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MSDS

AMMONIUM NITRATE

Section I. Chemical Product and Company Identification

<i>Chemical Name:</i>	Ammonium Nitrate	<i>Supplier:</i>	HUMMEL CROTON INC.
<i>Synonym:</i>	Ammonium Saltpeter, Ammonium Salt of Nitric Acid		10 Harmich Road
<i>Chemical Formula:</i>	NH_4NO_3		South Plainfield, NJ 07080
<i>CAS Number:</i>	6484-52-2	<i>Tel #:</i>	(908)-754-1800

**In case of Emergency Call: Chemtrec® (800)-424-9300(U.S.)
(703)-527-3887 (International)**

Section II. Composition and information on Ingredients

<i>Chemical Name</i>	<i>CAS Number</i>	<i>% Percent</i>	<i>OSHA</i>	<i>ACGIH</i>
Ammonium Nitrate	6484-52-2	99+%	Not Established	Not Established

Since no exposure limit have been established for Ammonium Nitrate by OSHA & ACGIH, we recommend that our product should be treated as a nuisance dust 15 mg/m³.

Section III. Hazards Identification

Acute Health Effects Irritating to the skin and eyes on contact. Inhalation will cause irritation to the lungs and mucus membrane. Irritation to the eyes will cause watering and redness. Reddening, scaling, and itching are characteristics of skin inflammation. Follow safe industrial hygiene practices and always wear protective equipment when handling this compound.

Chronic Health Effects: This product has no known chronic effects. Repeated or prolong exposure to this compound is not known to aggravate medical conditions.

Carcinogenicity: This product is not listed by NTP, IARC or regulated as a Carcinogen by OSHA.

Section IV. First Aid Measures

First Aid For Eye: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

First Aid For Skin: In case of contact, flush skin with water. Wash clothing before reuse. Call a physician if irritation occurs.

First Aid For Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

First Aid For Ingestion: If swallowed, call a physician immediately.

Section V. Fire and Explosion Date

<i>Flamability:</i>	Non-Flamable	<i>Auto-Ignition:</i>	Not Applicable
<i>Flash Point:</i>	Not Applicable	<i>Flamable Limits:</i>	Not Applicable
<i>Extinguishing Media:</i>	Water Spray		
<i>Fire Fighting Procedures:</i>	Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. OXIDIZER. May explode when heated.		
<i>Fire/explosion Hazards:</i>	Contact with other material may cause fire. Emits toxic fumes under fire conditions. Container explosion may occur under fire conditions.		

Section VI. Accidental Release Measures

<i>Spill or Leak Procedures:</i>	Utilize recommended protective clothing and equipment. Clean spills in a manner that does not disperse dust into the air. Spill area can be washed with water. Collect wash water for approved disposal. Keep from entering water or ground water.
----------------------------------	--

Section VII. Handling and Storage

<i>Storage Temperatures:</i>	Ambient
<i>Shelf Life:</i>	Unlimited in tightly closed container.
<i>Special Sensitivity:</i>	Ammonium nitrate decomposes at about 210 C. The presence of impurities markedly lowers the decomposition temperature, e.g. chloride salts, metal oxides. The following powdered metals react violently or explosively with fused ammonium nitrate below 200 C: aluminum, antimony, bismuth, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, potassium, sodium, nickel, tin, zinc, titanium, as well as brass and stainless steel. Ignites or reacts on contact with: phosphorus, urea, sulfur, potassium nitrite, sawdust, sugar, trinitroanisole, charcoal, cyanoguanidine, potassium permanganate, acetic acid, acetic anhydride. Hot aqueous solutions of ammonium nitrate of above 50% concentration may decompose explosively under adiabatic conditions and confinement.
<i>Handling/Storage Precautions:</i>	Avoid breathing dust. Avoid getting in eyes or on skin. Wash thoroughly after handling. Store in a dry place away from direct sunlight, heat and incompatible materials (see Section X). Reseal containers immediately after use. Store away from food and beverages.

Section VIII. Exposure Controls/Personal Protection

<i>Eye Protection:</i>	Safety glasses or goggles.
<i>Skin Protection:</i>	PVC gloves with impervious boots, apron or coveralls. Employees should wash their hands and face before eating, drinking or using tobacco products.
<i>Respirator:</i>	Work ambient concentrations should be monitored and if the recommended exposure limit is exceeded, a NIOSH/MSHA approved dust respirator must be worn.
<i>Ventilation:</i>	Use local ventilation if dusting is a problem, to maintain air levels below the recommended exposure limit.
<i>Additional Protective Measures:</i>	Emergency showers and eye wash stations should be available. Educate and train employees in the safe use and handling of hazardous chemicals.

Section IX. Physical and Chemical Properties

<i>Physical Form:</i>	Solid crystals or prills
<i>Color:</i>	White
<i>Odor:</i>	Odorless

Molecular Weight: 80.05
Boiling Point: Decomposes at 210°C
Melting/freezing Point: Decomposes at 210°C
Solubility In Water: 1 g in 0.5 ml water
Specific Gravity: 1.72

Section X. Stability And Reactivity

Stability: Stable under ordinary conditions of use and storage.
Hazardous Polymerization: Will Not occur
Incompatibilities: Strong reducing agents, strong acids, finely powdered metals
Instable Conditions: Excessive temperatures (see Incompatibilities).
Decomposition Temperature: Decomposes at 210°C
Decomposition Products: Oxides of Nitrogen and Ammonia

Section XI. Toxicological Information

RTECS Number: BR9050000
Routes of Exposure: Eye contact. Ingestion. Inhalation. Skin contact.
Toxicity Data: Orl-Rat LD50: 2217 mg/kg
Unr-Mus LD50: 2085 mg/kg
Chronic Toxic Effects: This product has no known chronic effects. Repeated or prolong exposure to this compound is not known to aggravate medical conditions.
Acute Toxic Effects: Irritating to the skin and eyes on contact. Inhalation will cause irritation to the lungs and mucus membrane. Irritation to the eyes will cause watering and redness. Reddening, scaling, and itching are characteristics of skin inflammation. Follow safe industrial hygiene practices and always wear protective equipment when handling this compound.

Section XII. Ecological Information

Ecotoxicity: Not available at this time.

Section XIII. Disposal Considerations

Waste Disposal Method: Waste disposal should be in accordance with existing federal, state and local environmental regulations.

Section XIV. Transportation Information

<i>Proper Shipping Name:</i>	Ammonium Nitrate	<i>Class:</i>	5.1
<i>UN Number:</i>	1942	<i>DOT Label:</i>	Oxidizer
<i>P.G.:</i>	III		

Section XV. Regulatory Information

OSHA Status: This product is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

TSCA Chemical Inventory: This compound is on the EPA Toxic Substance Control Act (TSCA) inventory List

California Proposition 65: To the best of our knowledge, this product contains no levels of listed substances, which the state of California has found to cause cancer, birth defects or other reproductive effects.

SARA Title III:

Section 302 Extremely Hazardous Substances:	None
Section 311/312 Hazard Categories:	None
Section 313 Toxic Chemicals:	None

Section XVI. Other Information

HMS Rating:

Health	1
Flammability	0
Reactivity	3
Personal Protection	C

Prepared By: Mark Dugan & Elizabeth Serago

Date: July 21, 2003

Reason for Issue: Addition of HMIS

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PYROBOR[®]

Dehydrated Borax

Material Safety Data Sheet



Manufactured by:
IMC Chemicals Inc.
8300 College Boulevard
Overland Park, Kansas 66210

1 CHEMICAL PRODUCT & COMPANY IDENTIFICATION

PRODUCT NAME: PYROBOR[®], Dehydrated Borax
MANUFACTURER:
IMC Chemicals Inc.
8300 College Boulevard
Overland Park, Kansas 66210

EMERGENCY PHONE NUMBER:
24 Hour Information Service: 760-372-2281
CHEMTREC: 800-424-9300
PREPARATION/REVISION DATE: April 27, 1998
Supersedes September 28, 1995 Version

2 COMPOSITION/INFORMATION ON INGREDIENTS

NOTE: See Section 15 for Exposure Limits.

PRODUCT NAME: PYROBOR[®], Dehydrated Borax

FORMULA: $\text{Na}_2\text{B}_4\text{O}_7$

CHEMICAL NAME: Sodium Tetraborate, Anhydrous

SYNONYMS: Anhydrous Borax, Disodium Tetraborate, Dehydrated Borax, Borax Glass

COMPONENTS:

Material: Sodium Tetraborate, Anhydrous

CAS Number: 1330-43-4

Composition: > 99%

Sodium Tetraborate, Anhydrous is hazardous under the OSHA Hazard Communication Standard based on animal chronic toxicity studies of similar organic Borates.

3 HAZARDS IDENTIFICATION

NOTE: Sodium Tetraborate is chemically and toxicologically related to Boric Acid; the majority of the Borate chronic toxicology studies were conducted using Boric Acid. Sodium Tetraborate is converted to Boric Acid in biological systems. The Boric Acid data discussed in this section can be converted to Sodium Tetraborate equivalent data by dividing by a factor of 1.2292.

EMERGENCY OVERVIEW: Sodium Tetraborate is a white odorless, powdered substance that is not flammable, combustible, or explosive, and it presents no unusual hazard if involved in a fire. Sodium Tetraborate presents little or no hazard (to humans) and has low acute oral and dermal toxicities. Care should be taken to minimize the amount of Sodium Tetraborate released to the environment to avoid ecological effects.

ROUTES OF EXPOSURE: In the occupational setting, inhalation is the most important route of exposure. Dermal absorption is usually not important because Sodium Tetraborate is not absorbed through the intact skin.

INHALATION: Mild irritation to nose and throat may occur when the PEL or TLV are exceeded (see Section 15).

EYE CONTACT: Exposure to Sodium Tetraborate dust may cause eye irritation.

DERMAL CONTACT: Sodium Tetraborate is non-irritating to the intact skin. Can be readily absorbed through broken or abraded skin.

INGESTION: Sodium Tetraborate is not intended for ingestion. Amounts greater than one teaspoonful, when ingested, may cause gastrointestinal problems.

CANCER: Sodium Tetraborate is not considered a carcinogen.

REPRODUCTIVE: A human study of occupationally exposed Borate worker population showed no adverse reproductive effects. Animal studies of similar organic Borates demonstrated reproductive effects in males.

TARGET ORGANS: No target organs have been determined in humans. High dose animal ingestion studies indicate that the testes is the target organ.

SIGNS AND SYMPTOMS OF EXPOSURE: Symptoms of accidental over-exposure to Borates have been associated with ingestion or absorption through large areas of damaged skin. These may include nausea, vomiting, and diarrhea, with delayed effects of skin redness and peeling.

See Section 11 for details on Toxicological Data.

4 EMERGENCY & FIRST AID PROCEDURES

EYES: Continuously flush exposed eyes, occasionally lifting the upper and lower lids. Get medical attention if irritation persists.

SKIN: Sodium Tetraborate is non-irritating in the normal occupational setting. If irritation occurs, wash affected area with soap or mild detergent and large amounts of water. Get medical attention if irritation persists.

INHALATION: No specific treatment is necessary since Sodium Tetraborate is not likely to be hazardous by inhalation. Prolonged exposure to dust levels in excess of regulatory limits should always be avoided.

INGESTION: If amounts greater than one teaspoon are swallowed, give two glasses of water to drink and seek medical attention.

NOTE TO PHYSICIAN: Adult ingestion of a few grams requires observation only. For ingestion in excess of 6 grams, maintain adequate kidney function and force fluids. Gastric lavage is recommended for symptomatic patients only. Hemodialysis should be reserved for massive acute ingestion or patients with renal failure. Boron analysis of urine or blood is useful only for documenting exposure and should not be used for evaluating severity of poisoning or to guide treatment. [additional reference: Litovitz, T.L., Norman, S.A., Veltri, J.C., Annual Report of the American Association of Poison Control Centers Data Collection system. Am J. of Emergency Med. 1986; 4:427-458.]

5

FIRE FIGHTING MEASURES

GENERAL HAZARD: Sodium Tetraborate is not flammable, combustible, or explosive. Sodium Tetraborate presents no unusual hazards when involved in a fire. This product is an inherent fire retardant.
HAZARD: Not Applicable
FLASH POINT: Not Applicable

AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABILITY CLASSIFICATION: Flammability Classification (29 CFR 1910.1200), Non-flammable solid.
EXTINGUISHING MEDIA: Any fire extinguishing media may be used on nearby fires.

6

ACCIDENTAL RELEASE MEASURES

ACTION TO TAKE FOR SPILLS OR LEAKS: Borates may damage trees and vegetation (see Ecological Information, Section 12, for further information). For dry spills, sweep, vacuum, or shovel and place in containers for disposal in accordance with applicable regulations (refer to Sections 13 and 15 for additional references and information regarding California and EPA regulations). Avoid contamination of bodies of water during cleanup. Sodium Tetraborate will cause localized contamination of surrounding waters

depending on amount dissolved in these waters. Some damage to local vegetation, fish, and other aquatic life may be expected (see Section 12). Under usual conditions, no protective equipment is required.

Sodium Tetraborate is a non-hazardous waste when spilled or disposed of, as defined in the Resource Conservation and Recovery Act (RCRA) regulations (40 CFR 261). (See Section 15)

7

HANDLING & STORAGE

GENERAL: Dry, indoor storage under normal atmospheric conditions is recommended. To maintain package integrity and to minimize caking of the product, bags should be handled on a "first-in-first-out" basis. Good housekeeping should be maintained to minimize dust accumulation and

generation. Sodium Tetraborate may cake in moist conditions.
HYGIENIC PRACTICES: Wash hands thoroughly with soap and water after handling and before eating, drinking, or smoking.

8

EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Use local exhaust ventilation to keep airborne levels below exposure limits (see Section 15).
EYE PROTECTION: Use goggles or vented safety glasses in excessively dusty conditions.

SKIN PROTECTION: Not required under normal conditions. Use if excessively dusty or if skin is damaged.
RESPIRATORY PROTECTION: Use appropriate NIOSH/MSHA certified respirators when levels are expected to exceed exposure limits (see Section 15).

9

PHYSICAL & CHEMICAL PROPERTIES

SOLUBILITY IN WATER: 2.5% at 20°C; 34.5% at 100°C
APPEARANCE AND ODOR: White granular solid, odorless.
MOLECULAR WEIGHT: 201.22
BOILING POINT: Not Applicable
MELTING POINT: 742°C

pH VALUE: At 20°C: 1% solution - 8.25
VAPOR PRESSURE: Not Applicable
FLASH POINT: None
SPECIFIC GRAVITY: 2.37
VAPOR PRESSURE: Not Applicable

10

STABILITY & REACTIVITY DATA

STABILITY: Stable under normal conditions; forms partial hydrate in moist air.
INCOMPATIBILITY: Reaction with strong reducing agents such as metal hydrides or alkali metals will generate hydrogen gas which could create an

explosive hazard.
HAZARDOUS DECOMPOSITION PRODUCTS: None known.
HAZARDOUS POLYMERIZATION: Will not occur.

11

TOXICOLOGICAL EFFECTS

NOTE: Sodium Tetraborate is chemically and toxicologically related to Boric Acid; the majority of the Borate chronic toxicology studies were conducted using Boric Acid. Sodium Tetraborate is converted to Boric Acid in biological systems. The Boric Acid data discussed in this section can be converted to Sodium Tetraborate equivalent data by dividing by a factor of 1.2292.

EYES: Boric Acid, when applied to the eyes of albino rabbits (Draize test), produced effects of mild erythema, and mild to moderate discharge in 5 of 6 rabbits. All signs subsided by the fourth day after application. Fifty years of occupational exposure history indicates no human eye injury from exposure to Sodium Tetraborate.

SKIN: Boric Acid was applied to the skin of albino rabbits. Slight to no irritation persisted 72 hours after application. No evidence of tissue damage was found. Low acute dermal toxicity; LD₅₀ for rabbits is expected to be greater than 2,000 mg/kg of body weight (test conducted per 16 CFR 1500.41). Sodium Tetraborate is not absorbed through intact skin.

11 Cont'd**TOXICOLOGICAL EFFECTS**

INHALATION: Human epidemiological studies show no increase in pulmonary disease in occupational populations with chronic exposure to Boric Acid and Sodium Borate dust.

INGESTION: Low acute oral toxicity; LD₅₀ for Sprague-Dawley rats is 4,500 to 5,000 mg/kg of body weight.

CARCINOGENICITY: Sodium Tetraborate is not listed as a carcinogen by the Environmental Protection Agency (EPA), the State of California, or the International Agency for Research on Cancer (IARC). A report issued by the National Toxicology Program showed "no evidence of carcinogenicity" from a full two-year bioassay on Boric Acid on mice at feed doses of 2,500 to 5,000 ppm in the diet. No mutagenic activity was observed for Boric Acid in a recent battery of four short-term mutagenicity assays.

REPRODUCTIVE: A human study of occupationally exposed Borate worker population showed no adverse reproductive effects. Animal studies indicate that Boric Acid reduces or inhibits sperm production, causes testicular atrophy, and, when given to pregnant animals during gestation, may cause developmental changes. These feed studies were conducted under chronic exposure conditions leading to doses many times in excess of those that

could occur through inhalation of dust in the occupational setting. Dietary levels of Boric Acid of 6,700 ppm in chronic feeding studies in rats and dogs produced testicular changes [Weir, Fisher, 1972]. In chronic feeding studies of mice on diets containing 5,000 ppm Boric Acid, testicular atrophy was present, while mice fed 2,500 ppm Boric Acid showed no significant increase in testicular atrophy. In another chronic Boric Acid study, degeneration of seminiferous tubules was present together with a reduction of germ cells in mice fed 4,500 ppm Boric Acid. In a reproduction study on rats, 2,000 ppm of dietary Boric Acid had no adverse effect on lactation, litter size, weight and appearance [Weir, Fisher, 1972]. In a continuous breeding study in mice, there was a reduction in fertility rates in males receiving 4,500 ppm Boric Acid, but not for females receiving 4,500 ppm Boric Acid [Fall et al., 1992].

Boric Acid at dietary levels of 1,000 ppm administered to pregnant female rats throughout gestation caused a slight reduction in fetal weight, but was considered close to NOAEL. Doses of 2,000 ppm and above caused fetal malformations and maternal toxicity. In mice, the no effect level for fetal weight reduction and maternal toxicity was 1,000 ppm Boric Acid. Fetal weight loss was noted at dietary levels of 2,000 ppm and above. Malformations (agenesis or shortening of the thirteenth rib) were seen at 4,000 ppm [Heindel et al., 1992].

12**ECOLOGICAL DATA**

NOTE: Boron is the element in Sodium Tetraborate which is used to characterize Borate product ecological effects. To convert Sodium Tetraborate data to Boron, multiply by 0.2149.

FISH TOXICITY: Boron naturally occurs in seawater at an average concentration of 5 mg B/liter. In laboratory studies the acute toxicity (96-hr LC₅₀) for under-yearling Coho salmon (*Oncorhynchus kisutch*) in seawater was determined as 40 mg B/L (added as Sodium Metaborate). The Minimum Lethal Dose for minnows exposed to Boric Acid at 20°C for 6 hours is 18,000 to 19,000 mg/L in distilled water, 19,000 to 19,500 in hard water.

Rainbow trout (*S. gairdneri*)

24-day LC₅₀ = 150.0 mg B/L

36-day NOEC-LOEC = 0.75-1 mg B/L

Goldfish (*Carassius auratus*)

7-day NOEC-LOEC = 26.50 mg B/L

3-day LC₅₀ = 178 mg B/L

BIRD TOXICITY: Dietary levels of 100 mg/kg resulted in reduced growth of female mallards. As little as 30 mg/kg fed to mallard adults adversely affected the growth rate of offspring.

INVERTEBRATE TOXICITY:

Daphnids

48-hour LC₅₀ = 133 mg B/L

21-day NOEC-LOEC = 6-13 mg B/L

PHYTOTOXICITY: Although boron is an essential micro-nutrient for healthy growth of plants, it can be harmful to boron-sensitive plants in higher quantities. Plants and trees can easily be exposed by root absorption to toxic levels of boron in the form of water soluble Borate leached into nearby waters or soil. Care should be taken to minimize the amount of boron released to the environment.

ENVIRONMENTAL FATE DATA:

Persistence/Degradation: Boron is naturally occurring and is commonly found in the environment. Sodium Tetraborate decomposes in the environment to natural Borate.

Soil Mobility: The product is soluble in water and is leachable through normal soil.

13**DISPOSAL CONSIDERATIONS**

DISPOSAL GUIDANCE: Small amounts of Sodium Tetraborate can usually be disposed of at municipal landfill sites, and requires no special treatment. Tonnage quantities are not however, recommended for the landfill, and if possible, should be re-used for an appropriate application. Refer to state and local regulations for applicable site-specific requirements. Sodium Tetraborate is not currently listed under any sections of the U.S. Environmental Protection

Agency (EPA) Resource Conservation and Recovery Act (RCRA).

CALIFORNIA HAZARDOUS WASTE DESIGNATION: California identifies substances with acute LD₅₀'s of less than 2,500 mg/kg as "hazardous wastes". Sodium Tetraborate is, therefore, not a "hazardous waste" if spilled in California.

See Section 15 for details on Regulatory Information.

14**TRANSPORT REGULATIONS**

US DEPARTMENT of TRANSPORTATION (DOT) IDENTIFICATION NUMBER: Sodium Tetraborate is not a DOT Hazardous Material or Hazardous Substance.

INTERNATIONAL TRANSPORTATION: Sodium Tetraborate has no U.N. number, and is not regulated under international rail, highway, water, or air transport regulations.

15

REGULATORY INFORMATION

TSCA NUMBER: 1330-43-4

RCRA (40 CFR 261): Not listed under any section.

CERCLA (SUPERFUND): Not listed under any section.

CLEAN WATER ACT (CWA): Sodium Tetraborate, Anhydrous is not regulated by any water quality criteria under Section 304, is not listed as priority pollutant under Section 307, and is not listed as a hazardous substance under Section 311.

SAFE DRINKING WATER ACT (SDWA): Not regulated under SDWA, 42 USC 300g-1, 40 CFR 141 et seq. Consult state and local regulations for possible water quality advisories involving boron.

OCCUPATIONAL EXPOSURE LIMITS: Sodium Tetraborate is listed/regulated by OSHA, CAL OSHA & ACGIH.

OSHA: Permissible Exposure Limit (PEL): 10 mg/m³

CALIFORNIA OSHA: Permissible Exposure Limit (PEL): 5 mg/m³

ACGIH: Threshold Limit Value (TLV): 1 mg/m³

NTP ANNUAL REPORT ON CARCINOGENS: Not listed as a carcinogen.

OSHA CARCINOGEN: Not listed as an OSHA carcinogen.

CONEG MODEL LEGISLATION: Meets all the CONEG requirements relating to heavy metal limitations on components of packaging materials.

CLEAN AIR ACT (CAA): This product was not manufactured with and does not contain any Class I or Class II ozone depleting substances, and defined by EPA.

INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC): Not listed as a carcinogen.

CALIFORNIA PROPOSITION 65: Not listed as a carcinogen or reproductive toxin. Warning - This product contains trace amounts of arsenic. Arsenic is known to the State of California cause cancer, reproductive harm or birth defects. This warning required by 25249.6 of the California Health and Safety Code.

16

OTHER INFORMATION

OTHER INFORMATION:

Product Label Text Hazard Information:

- May be harmful if swallowed.
- May cause reproductive harm or birth defects based on animal data.
- May cause eye irritation.
- Avoid contamination of food or feed.
- Not for food, drug or pesticidal use.
- Practice good housekeeping.
- Refer to MSDS.
- KEEP OUT OF THE REACH OF CHILDREN.

National Fire Protection Association (NFPA) Classification:

4 = Severe, 3 = Serious, 2 = Moderate, 1 = Slight, 0 = Minimal

Health	0
Flammability	0
Reactivity	0

Hazardous Materials Information Systems (HMIS):

4 = Extreme, 3 = High, 2 = Moderate, 1 = Slight, 0 = Insignificant

Blue: (Acute Health)	1*
Red: (Flammability)	0
Yellow: (Reactivity)	0

* Chronic Effects (for explanation see Section 11)

NOTICE

Judgements as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, IMC Chemicals Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or for consequences of its use.

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Date Issued: 1997-11-12
Supersedes: 1997-10-14
845/20

TEXACO
MATERIAL SAFETY DATA SHEET

NOTE: Read and understand Material Safety Data Sheet before handling or disposing of product.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATERIAL IDENTITY

Product Code and Name:

07998 TEXACO EXTENDED LIFE PREDILUTED 50/50 COOLANT/AF

Chemical Name and/or Family or Description:

Antifreeze

Manufacturer's Name and Address:

TEXACO LUBRICANTS COMPANY

P.O. Box 4427

Houston, TX 77210-4427

Telephone Numbers:

Transportation Emergency-Company : (914) 831-3400

CHEMTREC (USA): (800) 424-9300

In Canada : (800) 567-7455

Health Emergency -Company : (914) 831-3400

General MSDS Assistance : (914) 838-7204

Texaco FaxBack System : (713) 432-3383

Technical Information -Fuels : (914) 838-7336

-Lubricant/: (800) 782-7852(Option 4)

Antifreezes/Fuel Additives

-Solvents/Chemicals : (800) 876-3738

2. COMPOSITION/INFORMATION ON INGREDIENTS

THE CRITERIA FOR LISTING COMPONENTS IN THE COMPOSITION SECTION IS AS FOLLOWS: CARCINOGENS ARE LISTED WHEN PRESENT AT 0.1 % OR GREATER; COMPONENTS WHICH ARE OTHERWISE HAZARDOUS ACCORDING TO OSHA ARE LISTED WHEN PRESENT AT 1.0 % OR GREATER; NON-HAZARDOUS COMPONENTS ARE LISTED AT 3.0 % OR GREATER. THIS IS NOT INTENDED TO BE A COMPLETE COMPOSITIONAL DISCLOSURE. REFER TO SECTION 14 FOR APPLICABLE STATES' RIGHT TO KNOW AND OTHER REGULATORY INFORMATION.

Product and/or Component(s) Carcinogenic According to:

OSHA	IARC	NTP	OTHER	NONE
-	-	-	-	X

Composition: (Sequence Number and Chemical Name)

Seq.	Chemical Name	CAS Number	Range in %
01	Water deionized	7732-18-5	50.00-64.99
02 *	1,2 ethanediol	107-21-1	35.00-49.99
03 *	Hexanoic acid, 2-ethyl-, potassium salt	3164-85-0	1.00-2.99

PRODUCT IS HAZARDOUS ACCORDING TO OSHA (1910.1200).

* COMPONENT IS HAZARDOUS ACCORDING TO OSHA.

Exposure Limits referenced by Sequence Number in the Composition Section

Seq.	Limit
02	50 ppm CEILING-OSHA
02	39.4 ppm CEILING-ACGIH (AEROSOL) (A4)

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Appearance:

Red liquid

Odor:

Mild odor

PAGE: 1

N.D. - NOT DETERMINED
< - LESS THAN

N.A. - NOT APPLICABLE
> - GREATER THAN

N.T. - NOT TESTED



3. HAZARD IDENTIFICATION (CONT)

WARNING STATEMENT

WARNING ! HARMFUL IF SWALLOWED
MAY CAUSE DIZZINESS AND DROWSINESS
MAY CAUSE EYE IRRITATION
ASPIRATION HAZARD IF SWALLOWED -
CAN ENTER LUNGS AND CAUSE DAMAGE
FOR INDUSTRIAL USE ONLY
CAN CAUSE KIDNEY DAMAGE IF SWALLOWED
MAY CAUSE LIVER DAMAGE IF SWALLOWED BASED ON ANIMAL DATA
ATTENTION ! CONTAINS ETHYLENE GLYCOL WHICH MAY CAUSE BIRTH DEFECTS BASED
ON ANIMAL DATA
CONTAINS 2-ETHYLHEXANDIC ACID OR ITS SALT WHICH MAY CAUSE
ADVERSE REPRODUCTIVE EFFECTS AND BIRTH DEFECTS BASED ON
ANIMAL DATA

HMIS

Health: 2 Reactivity: 0
Flammability: 1 Special : -

NFPA

Health: 2 Reactivity: 0
Flammability: 1 Special : -

POTENTIAL HEALTH EFFECTS

	EYE	SKIN	INHALATION	INGESTION
Primary Route of Exposure:	X	X	X	-

EFFECTS OF OVEREXPOSURE

Acute:

Eyes:

May cause irritation, experienced as mild discomfort and seen as slight excess redness of the eye.

Skin:

Brief contact is not irritating. Prolonged contact, as with clothing wetted with material, may cause defatting of skin or irritation, seen as local redness with possible mild discomfort.

Other than the potential skin irritation effects noted above, acute (short term) adverse effects are not expected from brief skin contact; see other effects, below, and Section 11 for information regarding potential long term effects.

Inhalation:

Vapors or mist, in excess of permissible concentrations, or in unusually high concentrations generated from spraying, heating the material or as from exposure in poorly ventilated areas or confined spaces, may cause irritation of the nose and throat, headache, nausea, and drowsiness.

Prolonged or repeated overexposure may result in the absorption of potentially harmful amounts of material.

Ingestion:

Contains ethylene glycol and/or diethylene glycol, which are toxic when swallowed. A lethal dose for an adult is 1-2 ml per kilogram, or about 4 ounces (one-half cup). Symptoms include headache, weakness, confusion, dizziness, staggering, slurred speech, loss of coordination, faintness, nausea and vomiting, increased heart rate, decreased blood pressure, difficulty breathing and seeing, pulmonary edema, unconsciousness, convulsions, collapse, and coma. Symptoms may be delayed. Decreased urine output and kidney failure may also occur. Severe poisoning may cause death.

Aspiration may occur during swallowing or vomiting, resulting in lung damage.

Sensitization Properties:

Unknown.

Chronic:

Repeated ingestion may cause kidney damage.

Medical Conditions Aggravated by Exposure:

Repeated overexposure may aggravate existing kidney disease.



PRODUCT CODE: 07998

Date Issued: 1997-11-12

NAME: TEXACO EXTENDED LIFE PREDILUTED 50/50 COOLANT/AF

Supersedes: 1997-10-14

3. HAZARD IDENTIFICATION (CONT)

Other Remarks:

None

4. FIRST AID MEASURES

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes. Hold eyelids apart while flushing to rinse entire surface of eye and lids with water. Get medical attention.

Skin:

Wash skin with plenty of soap and water until all traces of material are removed. Remove and clean contaminated clothing (See Other Instructions). Destroy non-resistant footwear. Get medical attention if skin irritation persists or contact has been prolonged.

Ingestion:

If person is conscious and can swallow, immediately give two glasses (i.e., 16 oz.) of water but do not induce vomiting. Get immediate medical attention. Never give anything by mouth to an unconscious or convulsing person.

Inhalation:

If irritation, headache, nausea, or drowsiness occurs, remove to fresh air. Get medical attention if breathing becomes difficult or respiratory irritation persists.

Other Instructions:

Ethylene glycol (EG) and diethylene glycol (DEG) intoxication may initially produce behavioral changes, drowsiness, vomiting, diarrhea, thirst, and convulsions. EG and DEG are nephrotoxic. End stages of poisoning may include renal damage or failure with acidosis. Supportive measures, supplemented with hemodialysis if indicated, may limit the progression and severity of toxic effects.

FOR ETHYLENE GLYCOL POISONING intravenous ethanol is a recognized antidotal treatment; other antidotal treatments also exist for EG poisoning.

FOR DIETHYLENE GLYCOL POISONING the role of intravenous ethanol in the treatment is unclear but it may be of benefit in view of structural and toxicological similarities to ethylene glycol. Contact a Poison Center for further treatment information.

Aspiration of this product during induced emesis may result in severe lung injury. If evacuation of stomach is necessary, use method least likely to cause aspiration, such as gastric lavage after endotracheal intubation. Contact a Poison Center for additional treatment information.

5. FIRE-FIGHTING MEASURES

Ignition Temperature - AIT (degrees F):

Not determined.

Flash Point (degrees F):

Not applicable.

Flammable Limits (%):

Lower: Not determined.

Upper: Not determined.

Recommended Fire Extinguishing Agents And Special Procedures:

Use water spray, dry chemical, foam, or carbon dioxide to extinguish flames. Use water spray to cool fire-exposed containers. Water or foam may cause frothing.

Unusual or Explosive Hazards:

None

Extinguishing Media Which Must Not Be Used:

Not determined.

Special Protective Equipment for Firefighters:

Wear full protective clothing and positive pressure breathing apparatus. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products.

PAGE: 3

N.D. - NOT DETERMINED

N.A. - NOT APPLICABLE

N.T. - NOT TESTED

< - LESS THAN

> - GREATER THAN

PRODUCT CODE: 07998
NAME: TEXACO EXTENDED LIFE PREDILUTED 50/50 COOLANT/AF

Date Issued: 1997-11-12
Supersedes: 1997-10-14



6. ACCIDENTAL RELEASE MEASURES (Transportation Spills: CHEMTREC (800)424-9300)

Procedures in Case of Accidental Release, Breakage or Leakage:

Ventilate area. Avoid breathing vapor. Wear appropriate personal protective equipment, including appropriate respiratory protection. Contain spill if possible. Wipe up or absorb on suitable material and shovel up. Prevent entry into sewers and waterways. Avoid contact with skin, eyes or clothing.

If more than 10,859 pounds of product is spilled, then report spill according to SARA 304 and/or CERCLA 102(a) requirements, unless product qualifies for the petroleum exemption (CERCLA Section 101(14)).

7. HANDLING AND STORAGE

Precautions to be Taken in

Handling:

Minimum feasible handling temperatures should be maintained.

Storage:

Periods of exposure to high temperatures should be minimized. Water contamination should be avoided.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective Equipment (Type)

Eye/Face Protection:

Safety glasses, chemical type goggles, or face shield recommended to prevent eye contact.

Skin Protection:

Protective clothing such as coveralls or lab coats should be worn. Launder or dry-clean when soiled. Gloves and boots resistant to chemicals and petroleum distillates required.

Respiratory Protection:

Airborne concentrations should be kept to lowest levels possible. If vapor, mist or dust is generated and the occupational exposure limit of the product, or any component of the product, is exceeded, use appropriate NIOSH or MSHA approved air purifying or air supplied respirator after determining the airborne concentration of the contaminant. Air supplied respirators should always be worn when airborne concentration of the contaminant or oxygen content is unknown.

Ventilation:

Adequate to meet component occupational exposure limits (see Section 2).

Exposure Limit for Total Product:

None established for product; refer to Section 2 for component exposure limits.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Red liquid

Odor:

Mild odor

Boiling Point (degrees F):

228

Melting/Freezing point (degrees F):

Not applicable.

Specific Gravity (water=1):

1.07

pH of undiluted product:

8.3

Vapor Pressure:

Not determined.

PAGE: 4

N.D. - NOT DETERMINED
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PRODUCT CODE: 07998 Date Issued: 1997-11-12
NAME: TEXACO EXTENDED LIFE PREDILUTED 50/50 COOLANT/AF Supersedes: 1997-10-14

9. PHYSICAL AND CHEMICAL PROPERTIES (CONT)

Viscosity:
< 20 cSt at 40.0 C

VOC Content:
Not determined.

Vapor Density (air=1):
2.1

Solubility in Water (%):
> 10

Other: None

10. STABILITY AND REACTIVITY

This Material Reacts Violently With:
(If Others is checked below, see comments for details)
Air Water Heat Strong Oxidizers Others None of These
X

Comments:
None

Products Evolved When Subjected to Heat or Combustion:
Toxic levels of carbon monoxide, carbon dioxide, irritating aldehydes and ketones, and combustion products or compounds of potassium.

Hazardous Polymerizations: DO NOT OCCUR

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION(ANIMAL TOXICITY DATA)

Median Lethal Dose

Oral:

Animal data does not reflect human toxicity; see Sections 3 & 11

Inhalation:

Not determined.

Dermal:

LD50 Believed to be > 1.00 - 2.00 g/kg (rabbit) slightly toxic

Irritation Index, Estimation of Irritation (Species)

Skin:

(Draize) Believed to be < .50 /8.0 (rabbit) no appreciable effect

Eyes:

(Draize) Believed to be > 15.00 - 25.00 /110 (rabbit) slightly irritating

Sensitization:

Not determined.

Other:

Oral administration of ethylene glycol to pregnant experimental animals has been shown to cause birth defects in the offspring. These effects were not seen when ethylene glycol was administered by dermal application or by inhalation.

Continuous ingestion of a diet containing 1% or 2% ethylene glycol for two years produced liver and kidney damage, and bladder stones in rats.

2-ethylhexanoic acid (2-EXA) caused an increase in liver size and enzyme levels when repeatedly administered to rats via the diet. When administered to pregnant rats by gavage or in drinking water, 2-EXA caused teratogenicity (birth defects) and delayed postnatal development of the pups. Additionally, 2-EXA impaired female fertility in rats. Birth defects were seen in the offspring of mice who were administered sodium 2-ethylhexanoate via intraperitoneal injection during pregnancy.



12. DISPOSAL CONSIDERATIONS

Waste Disposal Methods

This product has been evaluated for RCRA characteristics and does not meet the criteria of a hazardous waste if discarded in its purchased form. Under RCRA, it is the responsibility of the user of the product to determine at the time of disposal, whether the product meets RCRA criteria for hazardous waste. This is because product uses, transformations, mixtures, processes, etc. may render the resulting materials hazardous.

Remarks

To prevent contamination of drinking water supplies, and poisoning of children, aquatic life, wildlife, and farm and domestic animals, ethylene glycol products such as used antifreeze solution, regardless of quantity, should never be discarded onto the ground, into surface waters, or into storm sewers.

13. TRANSPORT INFORMATION

Transportation

DOT:

Proper Shipping Name:
Not regulated

This product contains a DOT Hazardous Substance or Substances, listed in Section 14 of the MSDS. If the product's shipping container holds at least 10,859 lbs, then the DOT information must be accompanied with RQ notation, or, an otherwise 'Not Regulated' product will be classified as Environmentally Hazardous (solid/liquid) N.O.S., Class 9, unless the product qualifies for the petroleum exemption (49 CFR 171.8).

IMDG:

Proper Shipping Name:
Not regulated

ICAO:

Proper Shipping Name:
Not regulated

TDG:

Proper Shipping Name:
Not regulated

14. REGULATORY INFORMATION

Federal Regulations:

SARA Title III:

Section 302/304 Extremely Hazardous Substances

Seq.	Chemical Name	CAS Number	Range in %
None			

Section 302/304 Extremely Hazardous Substances (CONT)

Seq.	TPO	RQ
None		

Section 311 Hazardous Categorization:

Acute	Chronic	Fire	Pressure	Reactive	N/A
X	X	-	-	-	-

Section 313 Toxic Chemical

Chemical Name	CAS Number	Concentration
1,2 ethanediol	107-21-1	35.00-49.99

CERCLA 102(a)/DOT Hazardous Substances: (+ indicates DOT Hazardous Substance)

Seq.	Chemical Name	CAS Number	Range in %
01+	1,2 ethanediol	107-21-1	35.00-49.99
02+	Sodium nitrite	7632-00-0	0.10-0.99
03+	Potassium hydroxide	1310-58-3	0.10-0.99

CERCLA/DOT Hazardous Substances (Sequence Numbers and RQ's):

Seq.	RQ
01+	5000
02+	100
03+	1000

PAGE: 6

N.D. - NOT DETERMINED
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N.T. - NOT TESTED



PRODUCT CODE: 07998

Date Issued: 1997-11-12

NAME: TEXACO EXTENDED LIFE PREDILUTED 50/50 COOLANT/AF

Supersedes: 1997-10-14

14. REGULATORY INFORMATION (CONT)

TSCA Inventory Status:

This product, or its components, are listed on or are exempt from the Toxic Substance Control Act (TSCA) Chemical Substance Inventory.

Other:

None.

State Regulations:

California Proposition 65:

The following detectable components of this product are substances, or belong to classes of substances, known to the State of California to cause cancer and/or reproductive toxicity.

Chemical Name

CAS Number

None

International Regulations:

Export Notification (TSCA-12b):

This product may be subject to export notification under TSCA section 12(b); contains:

Sodium nitrite

Diethylene glycol monobutyl ether

WHMIS Classification:

Class D, Div 1, Subdiv B: Toxic

Class D, Div 2, Subdiv A: Teratogenic

Class D, Div 2, Subdiv B: Chronic toxic effects

Canada Inventory Status:

Not determined.

EINECS Inventory Status:

Not determined.

Australia Inventory Status:

Not determined.

Japan Inventory Status:

Not determined.

15. ENVIRONMENTAL INFORMATION

Aquatic Toxicity:

Not determined.

Mobility:

Not determined.

Persistence and Biodegradability:

This product is estimated to have a moderate ($\geq 30\%$) rate of biodegradation in a test for ready biodegradation.

Potential to Bioaccumulate:

This product is estimated to have a low potential to bioconcentrate.

Remarks:

None

16. OTHER INFORMATION

Acute or chronic oral consumption of products containing ethylene glycol can produce significant adverse health effects, including death, in humans and animals. Keep out of reach of children and pets. Such products should not be used in potable (drinking) water systems or other systems where contamination of potable water supplies is possible (e.g., recreational vehicles, winterizing potable water systems).

Texaco recommends that all exposures to this product be minimized by strictly adhering to recommended occupational controls procedures to avoid any potential adverse health effects.

THE INFORMATION CONTAINED HEREIN IS BELIEVED TO BE ACCURATE. IT IS PROVIDED

PAGE: 7

N.D. - NOT DETERMINED

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N.T. - NOT TESTED

< - LESS THAN

> - GREATER THAN



PRODUCT CODE: 07998 Date Issued: 1997-11-12
NAME: TEXACO EXTENDED LIFE PREDILUTED 50/50 COOLANT/AF Supersedes: 1997-10-14

16. OTHER INFORMATION (CONT)

INDEPENDENTLY OF ANY SALE OF THE PRODUCT FOR PURPOSE OF HAZARD COMMUNICATION AS PART OF TEXACO'S PRODUCT SAFETY PROGRAM. IT IS NOT INTENDED TO CONSTITUTE PERFORMANCE INFORMATION CONCERNING THE PRODUCT. NO EXPRESS WARRANTY, OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS MADE WITH RESPECT TO THE PRODUCT OR THE INFORMATION CONTAINED HEREIN. DATA SHEETS ARE AVAILABLE FOR ALL TEXACO PRODUCTS. YOU ARE URGED TO OBTAIN DATA SHEETS FOR ALL TEXACO PRODUCTS YOU BUY, PROCESS, USE OR DISTRIBUTE AND YOU ARE ENCOURAGED AND REQUESTED TO ADVISE THOSE WHO MAY COME IN CONTACT WITH SUCH PRODUCTS OF THE INFORMATION CONTAINED HEREIN.

TO DETERMINE APPLICABILITY OR EFFECT OF ANY LAW OR REGULATION WITH RESPECT TO THE PRODUCT, USER SHOULD CONSULT HIS LEGAL ADVISOR OR THE APPROPRIATE GOVERNMENT AGENCY. TEXACO DOES NOT UNDERTAKE TO FURNISH ADVICE ON SUCH MATTERS.

Date: 1997-11-12 New ☒ Revised, Supersedes: 1997-10-14
Date printed: 1998-06-03

Inquiries regarding MSDS should be directed to:
Texaco Inc.
Manager, Product Safety
P.O. Box 509
Beacon, N.Y. 12508

PLEASE SEE NEXT PAGE FOR PRODUCT LABEL

PAGE: 8

N.D. - NOT DETERMINED
< - LESS THAN

N.A. - NOT APPLICABLE
> - GREATER THAN

N.T. - NOT TESTED



PRODUCT CODE: 07998
NAME: TEXACO EXTENDED LIFE PREDILUTED 50/50 COOLANT/AF

Date Issued: 1997-11-12
Supersedes: 1997-10-14

17. PRODUCT LABEL

Label Date: 1997-11-12

READ AND UNDERSTAND MATERIAL SAFETY DATA SHEET BEFORE HANDLING OR DISPOSING OF PRODUCT. THIS LABEL COMPLIES WITH THE REQUIREMENTS OF THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) FOR USE IN THE WORKPLACE. THIS LABEL IS NOT INTENDED TO BE USED WITH PACKAGING INTENDED FOR SALE TO CONSUMERS AND MAY NOT CONFORM WITH THE REQUIREMENTS OF THE CONSUMER PRODUCT SAFETY ACT OR OTHER RELATED REGULATORY REQUIREMENTS.

07998 TEXACO EXTENDED LIFE PREDILUTED 50/50 COOLANT/AF

WARNING STATEMENT

WARNING ! HARMFUL IF SWALLOWED
MAY CAUSE DIZZINESS AND DROWSINESS
MAY CAUSE EYE IRRITATION
ASPIRATION HAZARD IF SWALLOWED -
CAN ENTER LUNGS AND CAUSE DAMAGE
FOR INDUSTRIAL USE ONLY
CAN CAUSE KIDNEY DAMAGE IF SWALLOWED
MAY CAUSE LIVER DAMAGE IF SWALLOWED BASED ON ANIMAL DATA
ATTENTION ! CONTAINS ETHYLENE GLYCOL WHICH MAY CAUSE BIRTH DEFECTS BASED
ON ANIMAL DATA
CONTAINS 2-ETHYLHEXANOIC ACID OR ITS SALT WHICH MAY CAUSE
ADVERSE REPRODUCTIVE EFFECTS AND BIRTH DEFECTS BASED ON
ANIMAL DATA

PRECAUTIONARY MEASURES

- Use only with adequate ventilation.
- Avoid breathing vapor, mist, or gas.
- Avoid contact with eyes, skin, and clothing.
- Keep container closed.
- Wash thoroughly after handling.

FIRST AID

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes. Hold eyelids apart while flushing to rinse entire surface of eye and lids with water. Get medical attention.

Skin Contact:

Wash skin with plenty of soap and water until all traces of material are removed. Remove and clean contaminated clothing (See Other Instructions). Destroy non-resistant footwear. Get medical attention if skin irritation persists or contact has been prolonged.

Ingestion:

If person is conscious and can swallow, immediately give two glasses (i.e., 16 oz.) of water but do not induce vomiting. Get immediate medical attention. Never give anything by-mouth to an unconscious or convulsing person.

Inhalation:

If irritation, headache, nausea, or drowsiness occurs, remove to fresh air. Get medical attention if breathing becomes difficult or respiratory irritation persists.

Note to Physician:

Ethylene glycol (EG) and diethylene glycol (DEG) intoxication may initially produce behavioral changes, drowsiness, vomiting, diarrhea, thirst, and convulsions. EG and DEG are nephrotoxic. End stages of poisoning may include renal damage or failure with acidosis. Supportive measures, supplemented with hemodialysis if indicated, may limit the progression and severity of toxic effects.

FOR ETHYLENE GLYCOL POISONING intravenous ethanol is a recognized antidotal treatment; other antidotal treatments also exist for EG poisoning.

FOR DIETHYLENE GLYCOL POISONING the role of intravenous ethanol in the treatment is unclear but it may be of benefit in view of structural and toxicological similarities to ethylene glycol. Contact a Poison Center for further treatment information.

Aspiration of this product during induced emesis may result in severe lung injury. If evacuation of stomach is necessary, use method least likely to cause aspiration, such as gastric lavage after endotracheal intubation.

Contact a Poison Center for additional treatment information.

FIRE

In case of fire, use water spray, dry chemical, foam or carbon dioxide. Water may cause frothing. Use water spray to cool fire-exposed containers.

If more than 10,859 pounds of product is spilled, then report spill according to SARA 304 and/or CERCLA 102(a) requirements, unless product qualifies for the petroleum exemption (CERCLA Section 101(14)).

PAGE: 9

N.D. - NOT DETERMINED
< - LESS THAN

N.A. - NOT APPLICABLE
> - GREATER THAN

N.T. - NOT TESTED



PRODUCT CODE: 07998 Date Issued: 1997-11-12
NAME: TEXACO EXTENDED LIFE PREDILUTED 50/50 COOLANT/AF Supersedes: 1997-10-14

17. PRODUCT LABEL (CONT)

Label Date: 1997-11-12

Chemical Name	CAS Number	Range in %
Water deionized	7732-18-5	50.00-64.99
* 1,2 ethanediol	107-21-1	35.00-49.99
* Hexanoic acid, 2-ethyl-, potassium salt	3164-85-0	1.00-2.99

PRODUCT IS HAZARDOUS ACCORDING TO OSHA (1910.1200).
* COMPONENT IS HAZARDOUS ACCORDING TO OSHA.

Pennsylvania Special Hazardous Substance(s)	CAS Number	Range in %
None		

HMIS		NFPA	
Health: 2	Reactivity: 0	Health: 2	Reactivity: 0
Flammability: 1	Special: -	Flammability: 1	Special: -

Transportation

DOT:

Proper Shipping Name:
Not regulated

This product contains a DOT Hazardous Substance or Substances, listed in Section 14 of the MSDS. If the product's shipping container holds at least 10,859 lbs, then the DOT information must be accompanied with RQ notation, or, an otherwise 'Not Regulated' product will be classified as Environmentally Hazardous (solid/liquid) N.O.S., Class 9, unless the product qualifies for the petroleum exemption (49 CFR 171.8).

CAUTION: Misuse of empty containers can be hazardous. Empty containers can be hazardous if used to store toxic, flammable, or reactive materials. Cutting or welding of empty containers might cause fire, explosion or toxic fumes from residues. Do not pressurize or expose to open flame or heat. Keep container closed and drum bungs in place.

Manufacturer's Name and Address:
TEXACO LUBRICANTS COMPANY

P.O. Box 4427
Houston, TX 77210-4427

TRANSPORTATION EMERGENCY Company: (914) 831-3400
CHEMTREC: (800) 424-9300

HEALTH EMERGENCY Company: (914) 831-3400



Date Issued: 1997-11-12
Supersedes: 1997-10-14
845/20

TEXACO
MATERIAL SAFETY DATA SHEET

NOTE: Read and understand Material Safety Data Sheet before handling or disposing of product.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATERIAL IDENTITY

Product Code and Name:

07997 TEXACO EXTENDED LIFE COOLANT/ANTIFREEZE

Chemical Name and/or Family or Description:

Antifreeze

Manufacturer's Name and Address:

TEXACO LUBRICANTS COMPANY

P.O. Box 4427

Houston, TX 77210-4427

Telephone Numbers:

Transportation Emergency-Company : (914) 831-3400

CHEMTREC (USA): (800) 424-9300

In Canada : (800) 567-7455

Health Emergency -Company : (914) 831-3400

General MSDS Assistance : (914) 838-7204

Texaco FaxBack System : (713) 432-3383

Technical Information -Fuels : (914) 838-7336

-Lubricant/: (800) 782-7852 (Option 4)

Antifreezes/Fuel Additives

-Solvents/Chemicals : (800) 876-3738

2. COMPOSITION/INFORMATION ON INGREDIENTS

THE CRITERIA FOR LISTING COMPONENTS IN THE COMPOSITION SECTION IS AS FOLLOWS: CARCINOGENS ARE LISTED WHEN PRESENT AT 0.1 % OR GREATER; COMPONENTS WHICH ARE OTHERWISE HAZARDOUS ACCORDING TO OSHA ARE LISTED WHEN PRESENT AT 1.0 % OR GREATER; NON-HAZARDOUS COMPONENTS ARE LISTED AT 3.0 % OR GREATER. THIS IS NOT INTENDED TO BE A COMPLETE COMPOSITIONAL DISCLOSURE. REFER TO SECTION 14 FOR APPLICABLE STATES' RIGHT TO KNOW AND OTHER REGULATORY INFORMATION.

Product and/or Component(s) Carcinogenic According to:

OSHA IARC NTP OTHER NONE

- - - - - X

Composition: (Sequence Number and Chemical Name)

Seq.	Chemical Name	CAS Number	Range in %
01 *	1,2 ethanediol	107-21-1	80.00-94.99
02 *	Hexanoic acid, 2-ethyl-, potassium salt	3164-85-0	3.00-9.99

PRODUCT IS HAZARDOUS ACCORDING TO OSHA (1910.1200).

* COMPONENT IS HAZARDOUS ACCORDING TO OSHA.

Exposure Limits referenced by Sequence Number in the Composition Section

Seq.	Limit
01	50 ppm CEILING-OSHA
01	39.4 ppm CEILING-ACGIH (AEROSOL) (A4)

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Appearance:

Red liquid

Odor:

Mild odor

PAGE: 1

N.D. - NOT DETERMINED
< - LESS THAN

N.A. - NOT APPLICABLE
> - GREATER THAN

N.T. - NOT TESTED



3. HAZARD IDENTIFICATION (CONT)

WARNING STATEMENT

WARNING ! HARMFUL IF SWALLOWED
MAY CAUSE DIZZINESS AND DROWSINESS
MAY CAUSE EYE IRRITATION
ASPIRATION HAZARD IF SWALLOWED -
CAN ENTER LUNGS AND CAUSE DAMAGE
FOR INDUSTRIAL USE ONLY
CAN CAUSE KIDNEY DAMAGE IF SWALLOWED
MAY CAUSE LIVER DAMAGE IF SWALLOWED BASED ON ANIMAL DATA
ATTENTION ! CONTAINS ETHYLENE GLYCOL WHICH MAY CAUSE BIRTH DEFECTS BASED
ON ANIMAL DATA
CONTAINS 2-ETHYLHEXANOIC ACID OR ITS SALT WHICH MAY CAUSE
ADVERSE REPRODUCTIVE EFFECTS AND BIRTH DEFECTS BASED ON
ANIMAL DATA

HMIS

Health: 2 Reactivity: 0
Flammability: 1 Special : -

NFPA

Health: 2 Reactivity: 0
Flammability: 1 Special : -

POTENTIAL HEALTH EFFECTS

	EYE	SKIN	INHALATION	INGESTION
Primary Route of Exposure:	X	X	X	-

EFFECTS OF OVEREXPOSURE

Acute:

Eyes:

May cause irritation, experienced as mild discomfort and seen as slight excess redness of the eye.

Skin:

Brief contact may cause slight irritation. Prolonged contact, as with clothing wetted with material, may cause more severe irritation and discomfort, seen as local redness and swelling.

Other than the potential skin irritation effects noted above, acute (short term) adverse effects are not expected from brief skin contact; see other effects, below, and Section 11 for information regarding potential long term effects.

Inhalation:

Vapors or mist, in excess of permissible concentrations, or in unusually high concentrations generated from spraying, heating the material or as from exposure in poorly ventilated areas or confined spaces, may cause irritation of the nose and throat, headache, nausea, and drowsiness.

Prolonged or repeated overexposure may result in the absorption of potentially harmful amounts of material.

Ingestion:

Contains ethylene glycol and/or diethylene glycol, which are toxic when swallowed. A lethal dose for an adult is 1-2 ml per kilogram, or about 4 ounces (one-half cup). Symptoms include headache, weakness, confusion, dizziness, staggering, slurred speech, loss of coordination, faintness, nausea and vomiting, increased heart rate, decreased blood pressure, difficulty breathing and seeing, pulmonary edema, unconsciousness, convulsions, collapse, and coma. Symptoms may be delayed. Decreased urine output and kidney failure may also occur. Severe poisoning may cause death.

Aspiration may occur during swallowing or vomiting, resulting in lung damage.

Sensitization Properties:

Unknown.

Chronic:

Repeated ingestion may cause kidney damage.



PRODUCT CODE: 07997
NAME: TEXACO EXTENDED LIFE COOLANT/ANTIFREEZE

Date Issued: 1997-11-12
Supersedes: 1997-10-14

3. HAZARD IDENTIFICATION (CONT)

Medical Conditions Aggravated by Exposure:

Repeated overexposure may aggravate existing kidney disease.

Because of its irritating properties, repeated skin contact may aggravate an existing dermatitis (skin condition).

Other Remarks:

None

4. FIRST AID MEASURES

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes. Hold eyelids apart while flushing to rinse entire surface of eye and lids with water. Get medical attention.

Skin:

Wash skin with plenty of soap and water until all traces of material are removed. Remove and clean contaminated clothing (See Other Instructions). Destroy non-resistant footwear. Get medical attention if skin irritation persists or contact has been prolonged.

Ingestion:

If person is conscious and can swallow, immediately give two glasses (i.e., 16 oz.) of water but do not induce vomiting. Get immediate medical attention. Never give anything by mouth to an unconscious or convulsing person.

Inhalation:

If irritation, headache, nausea, or drowsiness occurs, remove to fresh air. Get medical attention if breathing becomes difficult or respiratory irritation persists.

Other Instructions:

Ethylene glycol (EG) and diethylene glycol (DEG) intoxication may initially produce behavioral changes, drowsiness, vomiting, diarrhea, thirst, and convulsions. EG and DEG are nephrotoxic. End stages of poisoning may include renal damage or failure with acidosis. Supportive measures, supplemented with hemodialysis if indicated, may limit the progression and severity of toxic effects. FOR ETHYLENE GLYCOL POISONING intravenous ethanol is a recognized antidotal treatment; other antidotal treatments also exist for EG poisoning. FOR DIETHYLENE GLYCOL POISONING the role of intravenous ethanol in the treatment is unclear but it may be of benefit in view of structural and toxicological similarities to ethylene glycol. Contact a Poison Center for further treatment information.

Aspiration of this product during induced emesis may result in severe lung injury. If evacuation of stomach is necessary, use method least likely to cause aspiration, such as gastric lavage after endotracheal intubation. Contact a Poison Center for additional treatment information.

5. FIRE-FIGHTING MEASURES

Ignition Temperature - AIT (degrees F):

Not determined.

Flash Point (degrees F):

260 (PMCC)

Flammable Limits (%):

Lower: Not determined.
Upper: Not determined.

Recommended Fire Extinguishing Agents And Special Procedures:

Use water spray, dry chemical, foam, or carbon dioxide to extinguish flames. Use water spray to cool fire-exposed containers. Water or foam may cause frothing.

Unusual or Explosive Hazards:

None

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N.D. - NOT DETERMINED
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N.T. - NOT TESTED



5. FIRE-FIGHTING MEASURES (CONT)

Extinguishing Media Which Must Not Be Used:
Not determined.

Special Protective Equipment for Firefighters:
Wear full protective clothing and positive pressure breathing apparatus.
Approach fire from upwind to avoid hazardous vapors and toxic decomposition products.

6. ACCIDENTAL RELEASE MEASURES (Transportation Spills: CHEMTREC (800)424-9300)

Procedures in Case of Accidental Release, Breakage or Leakage:
Ventilate area. Avoid breathing vapor. Wear appropriate personal protective equipment, including appropriate respiratory protection. Contain spill if possible. Wipe up or absorb on suitable material and shovel up. Prevent entry into sewers and waterways. Avoid contact with skin, eyes or clothing.

If more than 5,477 pounds of product is spilled, then report spill according to SARA 304 and/or CERCLA 102(a) requirements, unless product qualifies for the petroleum exemption (CERCLA Section 101(14)).

7. HANDLING AND STORAGE

Precautions to be Taken in

Handling:

Minimum feasible handling temperatures should be maintained.

Storage:

Periods of exposure to high temperatures should be minimized. Water contamination should be avoided.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective Equipment (Type)

Eye/Face Protection:

Safety glasses, chemical type goggles, or face shield recommended to prevent eye contact.

Skin Protection:

Protective clothing such as coveralls or lab coats should be worn. Launder or dry-clean when soiled. Gloves and boots resistant to chemicals and petroleum distillates required.

Respiratory Protection:

Airborne concentrations should be kept to lowest levels possible. If vapor, mist or dust is generated and the occupational exposure limit of the product, or any component of the product, is exceeded, use appropriate NIOSH or MSHA approved air purifying or air supplied respirator after determining the airborne concentration of the contaminant. Air supplied respirators should always be worn when airborne concentration of the contaminant or oxygen content is unknown.

Ventilation:

Adequate to meet component occupational exposure limits (see Section 2).

Exposure Limit for Total Product:

None established for product; refer to Section 2 for component exposure limits.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Red liquid

Odor:

Mild odor

Boiling Point (degrees F):

228

Melting/Freezing point (degrees F):

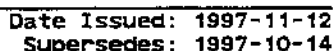
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N.T. - NOT TESTED



12. DISPOSAL CONSIDERATIONS

Waste Disposal Methods

This product has been evaluated for RCRA characteristics and does not meet the criteria of a hazardous waste if discarded in its purchased form. Under RCRA, it is the responsibility of the user of the product to determine at the time of disposal, whether the product meets RCRA criteria for hazardous waste. This is because product uses, transformations, mixtures, processes, etc. may render the resulting materials hazardous.

Remarks

To prevent contamination of drinking water supplies, and poisoning of children, aquatic life, wildlife, and farm and domestic animals, ethylene glycol products such as used antifreeze solution, regardless of quantity, should never be discarded onto the ground, into surface waters, or into storm sewers.

13. TRANSPORT INFORMATION

Transportation

DOT:

Proper Shipping Name:
Not regulated

This product contains a DOT Hazardous Substance or Substances, listed in Section 14 of the MSDS. If the product's shipping container holds at least 5,477 lbs, then the DOT information must be accompanied with RQ notation, or, an otherwise 'Not Regulated' product will be classified as Environmentally Hazardous (solid/liquid) N.O.S., Class 9, unless the product qualifies for the petroleum exemption (49 CFR 171.8).

IMDG:

Proper Shipping Name:
Not regulated

ICAO:

Proper Shipping Name:
Not regulated

TDG:

Proper Shipping Name:
Not regulated

14. REGULATORY INFORMATION

Federal Regulations:

SARA Title III:

Section 302/304 Extremely Hazardous Substances

Seq.	Chemical Name	CAS Number	Range in %
None			

Section 302/304 Extremely Hazardous Substances (CONT)

Seq.	TPQ	RQ
None		

Section 311 Hazardous Categorization:

Acute	Chronic	Fire	Pressure	Reactive	N/A
X	X	-	-	-	-

Section 313 Toxic Chemical

Chemical Name	CAS Number	Concentration
1,2 ethanediol	107-21-1	80.00-94.99

CERCLA 102(a)/DOT Hazardous Substances: (+ indicates DOT Hazardous Substance)

Seq.	Chemical Name	CAS Number	Range in %
01+	1,2 ethanediol	107-21-1	80.00-94.99
02+	Sodium nitrite	7632-00-0	0.10-0.99
03+	Potassium hydroxide	1310-58-3	0.10-0.99

CERCLA/DOT Hazardous Substances (Sequence Numbers and RQ's):

Seq.	RQ
01+	5000
02+	100
03+	1000

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PRODUCT CODE: 07997
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Date Issued: 1997-11-12
Supersedes: 1997-10-14

14. REGULATORY INFORMATION (CONT)

TSCA Inventory Status:

This product, or its components, are listed on or are exempt from the Toxic Substance Control Act (TSCA) Chemical Substance Inventory.

Other:

None.

State Regulations:

California Proposition 65:

The following detectable components of this product are substances, or belong to classes of substances, known to the State of California to cause cancer and/or reproductive toxicity.

Chemical Name	CAS Number
None	

International Regulations:

Export Notification (TSCA-12b):

This product may be subject to export notification under TSCA section 12(b); contains:

Sodium nitrite
Diethylene glycol monobutyl ether

WHMIS Classification:

Class D, Div 1, Subdiv B: Toxic
Class D, Div 2, Subdiv A: Teratogenic
Class D, Div 2, Subdiv B: Chronic toxic effects

Canada Inventory Status:

Not determined.

EINECS Inventory Status:

Not determined.

Australia Inventory Status:

Not determined.

Japan Inventory Status:

Not determined.

15. ENVIRONMENTAL INFORMATION

Aquatic Toxicity:

Not determined.

Mobility:

Not determined.

Persistence and Biodegradability:

This product is estimated to have a moderate ($\geq 30\%$) rate of biodegradation in a test for ready biodegradation.

Potential to Bioaccumulate:

This product is estimated to have a low potential to bioconcentrate.

Remarks:

None

16. OTHER INFORMATION

Acute or chronic oral consumption of products containing ethylene glycol can produce significant adverse health effects, including death, in humans and animals. Keep out of reach of children and pets. Such products should not be used in potable (drinking) water systems or other systems where contamination of potable water supplies is possible (e.g., recreational vehicles, winterizing potable water systems).

Texaco recommends that all exposures to this product be minimized by strictly adhering to recommended occupational controls procedures to avoid any potential adverse health effects.

THE INFORMATION CONTAINED HEREIN IS BELIEVED TO BE ACCURATE. IT IS PROVIDED

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Date Issued: 1997-11-12
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16. OTHER INFORMATION (CONT)

INDEPENDENTLY OF ANY SALE OF THE PRODUCT FOR PURPOSE OF HAZARD COMMUNICATION AS PART OF TEXACO'S PRODUCT SAFETY PROGRAM. IT IS NOT INTENDED TO CONSTITUTE PERFORMANCE INFORMATION CONCERNING THE PRODUCT. NO EXPRESS WARRANTY, OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS MADE WITH RESPECT TO THE PRODUCT OR THE INFORMATION CONTAINED HEREIN. DATA SHEETS ARE AVAILABLE FOR ALL TEXACO PRODUCTS. YOU ARE URGED TO OBTAIN DATA SHEETS FOR ALL TEXACO PRODUCTS YOU BUY, PROCESS, USE OR DISTRIBUTE AND YOU ARE ENCOURAGED AND REQUESTED TO ADVISE THOSE WHO MAY COME IN CONTACT WITH SUCH PRODUCTS OF THE INFORMATION CONTAINED HEREIN.

TO DETERMINE APPLICABILITY OR EFFECT OF ANY LAW OR REGULATION WITH RESPECT TO THE PRODUCT, USER SHOULD CONSULT HIS LEGAL ADVISOR OR THE APPROPRIATE GOVERNMENT AGENCY. TEXACO DOES NOT UNDERTAKE TO FURNISH ADVICE ON SUCH MATTERS.

Date: 1997-11-12 New X Revised, Supersedes: 1997-10-14
Date printed: 1998-06-03

Inquiries regarding MSDS should be directed to:
Texaco Inc.
Manager, Product Safety
P.O. Box 509
Beacon, N.Y. 12508

PLEASE SEE NEXT PAGE FOR PRODUCT LABEL

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PRODUCT CODE: 07997
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Date Issued: 1997-11-12
Supersedes: 1997-10-14

17. PRODUCT LABEL

Label Date: 1997-11-12

READ AND UNDERSTAND MATERIAL SAFETY DATA SHEET BEFORE HANDLING OR DISPOSING OF PRODUCT. THIS LABEL COMPLIES WITH THE REQUIREMENTS OF THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) FOR USE IN THE WORKPLACE. THIS LABEL IS NOT INTENDED TO BE USED WITH PACKAGING INTENDED FOR SALE TO CONSUMERS AND MAY NOT CONFORM WITH THE REQUIREMENTS OF THE CONSUMER PRODUCT SAFETY ACT OR OTHER RELATED REGULATORY REQUIREMENTS.

07997 TEXACO EXTENDED LIFE COOLANT/ANTIFREEZE

WARNING STATEMENT

WARNING ! HARMFUL IF SWALLOWED
MAY CAUSE DIZZINESS AND DROWSINESS
MAY CAUSE EYE IRRITATION
ASPIRATION HAZARD IF SWALLOWED -
CAN ENTER LUNGS AND CAUSE DAMAGE
FOR INDUSTRIAL USE ONLY
CAN CAUSE KIDNEY DAMAGE IF SWALLOWED
MAY CAUSE LIVER DAMAGE IF SWALLOWED BASED ON ANIMAL DATA
ATTENTION ! CONTAINS ETHYLENE GLYCOL WHICH MAY CAUSE BIRTH DEFECTS BASED
ON ANIMAL DATA
CONTAINS 2-ETHYLHEXANOIC ACID OR ITS SALT WHICH MAY CAUSE
ADVERSE REPRODUCTIVE EFFECTS AND BIRTH DEFECTS BASED ON
ANIMAL DATA

PRECAUTIONARY MEASURES

- Use only with adequate ventilation.
- Avoid breathing vapor, mist, or gas.
- Avoid contact with eyes, skin, and clothing.
- Keep container closed.
- Wash thoroughly after handling.

FIRST AID

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes. Hold eyelids apart while flushing to rinse entire surface of eye and lids with water. Get medical attention.

Skin Contact:

Wash skin with plenty of soap and water until all traces of material are removed. Remove and clean contaminated clothing (See Other Instructions). Destroy non-resistant footwear. Get medical attention if skin irritation persists or contact has been prolonged.

Ingestion:

If person is conscious and can swallow, immediately give two glasses (i.e., 16 oz.) of water but do not induce vomiting. Get immediate medical attention. Never give anything by mouth to an unconscious or convulsing person.

Inhalation:

If irritation, headache, nausea, or drowsiness occurs, remove to fresh air. Get medical attention if breathing becomes difficult or respiratory irritation persists.

Note to Physician:

Ethylene glycol (EG) and diethylene glycol (DEG) intoxication may initially produce behavioral changes, drowsiness, vomiting, diarrhea, thirst, and convulsions. EG and DEG are nephrotoxic. End stages of poisoning may include renal damage or failure with acidosis. Supportive measures, supplemented with hemodialysis if indicated, may limit the progression and severity of toxic effects.

FOR ETHYLENE GLYCOL POISONING intravenous ethanol is a recognized antidotal treatment; other antidotal treatments also exist for EG poisoning.

FOR DIETHYLENE GLYCOL POISONING the role of intravenous ethanol in the treatment is unclear but it may be of benefit in view of structural and toxicological similarities to ethylene glycol. Contact a Poison Center for further treatment information.

Aspiration of this product during induced emesis may result in severe lung injury. If evacuation of stomach is necessary, use method least likely to cause aspiration, such as gastric lavage after endotracheal intubation. Contact a Poison Center for additional treatment information.

FIRE

In case of fire, use water spray, dry chemical, foam or carbon dioxide. Water may cause frothing. Use water spray to cool fire-exposed containers.

If more than 5,477 pounds of product is spilled, then report spill according to SARA 304 and/or CERCLA 102(a) requirements, unless product qualifies for the petroleum exemption (CERCLA Section 101(14)).

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< - LESS THAN

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PRODUCT CODE: 07997
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Date Issued: 1997-11-12
Supersedes: 1997-10-14

17. PRODUCT LABEL (CONT)

Label Date: 1997-11-12

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Range in %</u>
* 1,2 ethanediol	107-21-1	80.00-94.99
* Hexanoic acid, 2-ethyl-, potassium salt	3164-85-0	3.00-9.99

PRODUCT IS HAZARDOUS ACCORDING TO OSHA (1910.1200).
* COMPONENT IS HAZARDOUS ACCORDING TO OSHA.

<u>Pennsylvania Special Hazardous Substance(s)</u>	<u>CAS Number</u>	<u>Range in %</u>
None		

HMIS		NFPA	
Health: 2	Reactivity: 0	Health: 2	Reactivity: 0
Flammability: 1	Special: -	Flammability: 1	Special: -

Transportation

DOT:

Proper Shipping Name:
Not regulated

This product contains a DOT Hazardous Substance or Substances, listed in Section 14 of the MSDS. If the product's shipping container holds at least 5,477 lbs, then the DOT information must be accompanied with RQ notation, or, an otherwise 'Not Regulated' product will be classified as Environmentally Hazardous (solid/liquid) N.O.S., Class 9, unless the product qualifies for the petroleum exemption (49 CFR 171.8).

CAUTION: Misuse of empty containers can be hazardous. Empty containers can be hazardous if used to store toxic, flammable, or reactive materials. Cutting or welding of empty containers might cause fire, explosion or toxic fumes from residues. Do not pressurize or expose to open flame or heat. Keep container closed and drum bungs in place.

Manufacturer's Name and Address:
TEXACO LUBRICANTS COMPANY

P.O. Box 4427
Houston, TX 77210-4427

TRANSPORTATION EMERGENCY Company: (914) 831-3400
CHEMTREC: (800) 424-9300

HEALTH EMERGENCY Company: (914) 831-3400

Material Safety Data Sheet
for
PORTLAND CEMENT

Section 1 - IDENTIFICATION

Product Names: Mountain Cement Portland Cement - Types I/II, V, Oilwell Class G

MSDS Information

This MSDS was produced in May 1999 and replaces any prior versions.

Product Code

Standard Industrial Classification: 3241

Chemical family

Calcium compounds. Calcium silicate compounds and other calcium compounds containing iron and aluminum make up the majority of this product. Major compounds:

$3\text{CaO} \cdot \text{SiO}_2$	Tricalcium silicate	CAS#12168-85-3
$2\text{CaO} \cdot \text{SiO}_2$	Dicalcium silicate	CAS#10034-77-2
$3\text{CaOAl}_2\text{O}_3$	Tricalcium aluminate	CAS#12042-78-3
$4\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot \text{Fe}_2\text{O}_3$	Tetracalcium aluminoferrite	CAS#12068-35-8
$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$	Calcium sulfate dihydrate or Gypsum	CAS#7778-18-9

Chemical name and synonyms

Portland cement. Also known as hydraulic cement.

Formula

This product consists of finely ground portland cement clinker mixed with a small amount of calcium sulfate.*

Supplier/Manufacturer

Mountain Cement Company

5 Sand Creek Road

Laramie, WY 82070

Emergency contact information

Scott Nielson 307-745-4879, Ext. 121

*Trace Elements

Portland cement is made from materials mined from the earth and is processed using energy provided by fuels; and therefore may contain trace amounts of naturally occurring materials which might be detected during chemical analysis. For example: Portland cement may contain up to 0.75% insoluble residue, of which <0.1% may be free crystalline silica. Other trace constituents may include potassium and sodium sulfate compounds, chromium compounds, and nickel compounds.

Section 2 - COMPONENTS

	OSHA PEL	ACGI TLV-TWA	NIOSH REL
<u>Hazardous Substances</u>	<u>(8-hour TWA)</u>	<u>(1995-1996)</u>	<u>(8-Hour TWA)</u>
Portland Cement Clinker (CAS #65997-15-1)	50 million particles/ft ³	10mg total dust/m ³	
Nominal 95% by weight			
Calcium sulfate (CAS #7778-18-9)	5mg respirable dust/m ³	10mg total dust/m ³	
[Gypsum (CAS #13397-24-5)]	10mg total dust/m ³		
Nominal 5% weight			
Calcium oxide (CAS #1306-78-8)	5mg/m ³	2mg/m ³	
(Free Lime)			
< 4% by weight			
Magnesium Oxide (CAS #1309-48-4)	15mg total dust/ m ³	10mg total dust/m ³	
< 5% by weight			

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Section 3 - HAZARDS IDENTIFICATION/TOXICOLOGICAL INFORMATION

Emergency Overview:

Portland cement is a light gray powder that poses little immediate hazard. A single short-term exposure to the dry powder is not likely to cause serious harm. However, exposure of sufficient duration to wet portland cement can cause serious, potentially irreversible tissue (including skin or eye) destruction in the form of chemical (caustic) burns, including third degree burns. The same type of tissue destruction can occur if wet or moist areas of the body are exposed for sufficient duration to dry portland cement.

Potential Health Effects:

Potential effects resulting from eye contact:

Exposure to airborne dust may cause immediate or delayed irritation or inflammation.

Eye contact by larger amounts of dry powder or splashes of wet portland cement may cause effects ranging from moderate eye irritation to chemical burns and blindness. Such exposures require immediate first aid (see Section 4) and medical attention to prevent significant damage to the eye.

Potential effects resulting from skin contact:

Discomfort or pain cannot be relied upon to alert a person to a hazardous skin exposure. Consequently, the only effective means of avoiding skin injury or illness involves minimizing or avoiding skin contact, particularly contact with wet cement. Persons exposed to wet cement may not feel discomfort until hours after the exposure has ended and significant injury has occurred.

Exposure to dry portland cement may cause drying of the skin with consequent mild irritation or more significant effects attributable to aggravation of other conditions. Dry portland cement contacting wet skin or exposure to moist or wet portland cement may cause more severe skin effects including thickening, cracking, or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of (caustic) chemical burns.

Some individuals may exhibit an allergic response upon exposure to portland cement, possibly due to trace amounts of chromium. The response may appear in a variety of forms ranging from a mild rash to severe skin ulcers. Persons already sensitized may react to their first contact with the product. Other persons may experience this effect after years of contact with hydraulic cement products.

Potential effects resulting from inhalation:

Portland cement may contain trace amounts (<0.1%) of free crystalline silica. Prolonged exposure to respirable free crystalline silica may aggravate other lung conditions. It may also cause delayed lung injury including silicosis, a disabling and potentially fatal lung disease.

Exposure to portland cement may cause irritation to the moist mucous membranes of the nose, throat, and upper respiratory system. It may also leave unpleasant deposits in the nose.

Potential effects resulting from ingestion:

Although small quantities of dust are not known to be harmful, ill effects are possible if larger quantities are consumed. Portland cement should not be eaten under any circumstances.

Carcinogenic Potential:

Portland cement is not listed as a carcinogen by IARC, NTP, or OSHA. It may, however, contain trace amounts (<0.1%) of substances listed as carcinogens by these organizations. Crystalline silica is now classified by IARC as a known human carcinogen (Group I). NTP had characterized respirable crystalline silica as "reasonably anticipated to be (a) carcinogen."

Medical Conditions Which May Be Aggravated By Inhalation or Dermal Exposure:

- Pre-existing upper respiratory and lung diseases.
- Unusual (hyper) sensitivity to hexavalent chromium (chromium +6) salts.

Section 4 - FIRST AID**Eyes**

Immediately flush eyes thoroughly with water. Continue flushing eye for at least 15 minutes, including under lids, to remove all particles. Call physician immediately.

Skin

Wash skin with cool water and pH-neutral soap or a mild detergent intended for use on skin. Seek medical treatment in all cases of prolonged exposure to wet cement, cement mixtures, liquids from fresh cement products, or prolonged wet skin exposure to dry cement.

Page 3 of 5

Inhalation of Airborne Dust

Remove to fresh air. Seek medical help if coughing and other symptoms do not subside. (Inhalation of gross amounts of portland cement requires immediate medical attention.)

Ingestion

Do not induce vomiting. If conscious, have the victim drink plenty of water and call a physician immediately.

Section 5 - FIRE & EXPLOSION DATA

Flash Point	None
Lower Explosive Limit	None
Upper Explosive Limit	None
Auto Ignition Temperature	Not combustible
Extinguishing Media	Not combustible
Special Fire Fighting Procedures	None. (Although portland cement poses no fire-related hazards, a self-contained breathing apparatus is recommended to limit exposure to combustion products when fighting any fire.)
Hazardous Combustion Products	None
Unusual Fire and Explosion Hazards	None

Section 6 - ACCIDENTAL RELEASE MEASURES

Collect dry material using a scoop. Avoid actions that cause dust to become airborne. Avoid inhalation of dust and contact with skin. Wear appropriate personal protective equipment as described in Section 8.

Scrape up wet material and place in an appropriate container. Allow the material to "dry" before disposal. Do not attempt to wash portland cement down drains.

Dispose of waste material according to local, state, and federal regulations.

Section 7 - HANDLING AND STORAGE

Keep portland cement dry until used. Normal temperature and pressure do not affect the material.

Promptly remove dusty clothing or clothing which is wet with cement fluids and launder before reuse. Wash thoroughly after exposure to dust or wet cement mixtures or fluids.

Section 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Skin Protection

Prevention is essential to avoiding potentially severe skin injury. Avoid contact with unhardened (wet) portland cement products. If contact occurs, promptly wash affected area with soap and water. Where prolonged exposure to unhardened portland cement products might occur, wear impervious clothing and gloves to eliminate skin contact.

Respiratory Protection

Avoid actions that cause dust to become airborne. Use local or general ventilation to control exposures below applicable exposure limits. Use NIOSH/MSHA-approved respirators in poorly ventilated areas when dust causes discomfort or irritation, or where there is an applicable exposure limit (Advisory: Respirators and filters purchased after July 10, 1998 must be certified under 42 CFR 84).

Ventilation

Use local exhaust or general dilution ventilation to control exposure within applicable limits.

Eye Protection

When engaged in activities where cement dust or wet cement or concrete could contract the eye, wear safety glasses with side shields or goggles. In extremely dusty environments and unpredictable environments, wear unvented or indirectly vented goggles to avoid eye irritation or injury. Contact lenses should not be worn when working with portland cement or fresh cement products.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Gray or White powder
Odor	No distinct odor
Physical state	Solid (powder)
pH (in water) (ASTM D 1293-95)	12 to 13
Solubility in water	Slightly soluble (0.1 to 1.0%)
Vapor pressure	Not applicable
Vapor density	Not applicable
Boiling point	Not applicable (i.e., > 1000° C)
Melting point	Not applicable
Specific gravity (H ₂ O = 1.0)	3.15
Evaporation rate	Not applicable

Section 10 - STABILITY AND REACTIVITY**Stability**

Stable

Conditions To Avoid

Unintentional contact with water

Incompatibility

Wet portland cement is alkaline. As such, it is incompatible with acids, ammonium salts, and aluminum metal.

Hazardous Decomposition

Will not spontaneously occur. Adding water results in hydration and produces (caustic) calcium hydroxide.

Hazardous Polymerization

Will not occur.

Section 11 - TOXICOLOGICAL INFORMATION – See Section 3**Section 12 - ECOLOGICAL INFORMATION****Ecotoxicity**

No recognized unusual toxicity to plants or animals.

Relevant Physical and Chemical Properties

(See Sections 9 and 10.)

Section 13 - DISPOSAL

Dispose of waste material, including bags, according to local, state and federal regulations.

Section 14 - TRANSPORTATION DATA

Hazardous Materials Description/Proper Shipping Name

Portland cement is not hazardous under U.S. Department of Transportation (DOT) regulations.

Section 15 - OTHER REGULATORY INFORMATIONStatus Under USDOL-OSHA Hazard Communication Rule, 29 CFR 1910.1200

Portland cement is considered a "hazardous chemical" under this regulation, and should be part of any hazard communication program.

Status Under CERCLA/Superfund 40 CFR 117 and 302 (v)

Not listed.

Hazard Category Under SARA (Title III) Section 311 and 312

Portland cement qualifies as a "hazardous substance" with delayed health effects.

Page 5 of 5

Status Under SARA (Title III) Section 313

Not subject to reporting requirements under Section 313.

Status Under TSCA (as of May 1997)

Some substances in portland cement are on the TSCA inventory list.

Status Under the Federal Hazardous Substances Act

Portland cement is a "hazardous substance" subject to the statutes promulgated under the subject act.

Status Under WHMIS

Portland cement is considered to be a hazardous material under the Hazardous Products Act as defined by the Controlled Products regulations (Class E - corrosive material) and is therefore subject to the labeling and MSDS requirements of the workplace hazardous information system (WHMIS).

Section 16 - OTHER INFORMATIONPrepared By

Mountain Cement Company

5 Sand Creek Rd.

Laramie, WY 82070

Revision Date

May 1999

Other Important Information

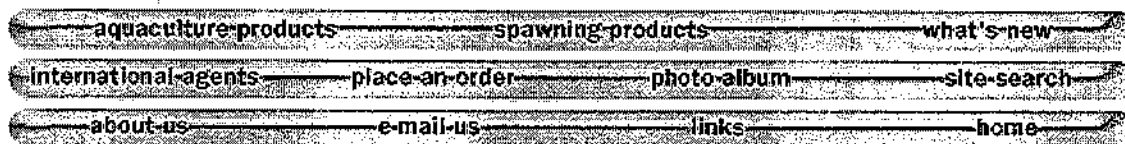
Portland cement should only be used by knowledgeable persons. Inexperienced product users must obtain proper training before using this product. A key to using the product safely requires the user to recognize that portland cement chemically reacts with water, and that some of the intermediate products of this reaction (that is, those present while a portland cement product is "setting") pose a far more severe hazard than does portland cement itself.

While the information provided in this material safety data sheet is believed to provide a useful summary of the hazards of portland cement as it is commonly used, the sheet cannot, and does not, anticipate and provide all of the information that might be needed in every situation. In particular, the data furnished in this sheet do

not address hazards that may be posed by other materials mixed with portland cement products. Users, therefore, should review other applicable material safety data sheets before working with this portland cement or working on portland cement products, for example, portland cement concrete.

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[Back to Product Information](#)



MATERIAL SAFETY DATA SHEET

COPPER SULFATE

Section I - IDENTIFICATION

PRODUCT: Copper sulfate

SYNONYMS: Cupric sulfate, Bluestone, Blue vitriol, Roman vitriol, Copper sulfate pentahydrate, Salzburg vitriol

CHEMICAL FORMULA: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

CHEMICAL ABSTRACT NO.: 7758-99-8

PRODUCT CODE NO.: 11560

Section II - HAZARDOUS INGREDIENTS

<u>COMPOSITION</u>	<u>%</u>	<u>TLV</u>	<u>HAZARD</u>
Copper sulfate pentahydrate	>99%	none	toxic,corrosive

Section III - HEALTH & FIRST AID INFORMATION

INHALATION: Breathing dust or mists may irritate the nose, throat and mucous membranes of the respiratory tract and cause coughing and chest discomfort. Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

INGESTION: Ingestion of a large quantity has caused vomiting, gastric pain, dizziness, exhaustion, anemia, cramps, convulsions, shock, coma and death. If conscious, immediately induce vomiting by giving large quantities of milk or egg whites, or if not available, water, and sticking a finger down the throat. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

EYE CONTACT: Liquid and mists may severely irritate or damage the eyes. Immediately flush eyes with lots of running water for at least 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

SKIN CONTACT: Contact with dust or solutions may irritate the skin. Immediate flush

skin with lots of running water for 15 minutes. Remove contaminated clothing and shoes, wash before reuse. Get immediate medical attention.

OTHER HEALTH INFORMATION: Chronic effects of exposure include damage to the nervous system and kidneys. Jaundice and liver enlargement have also been observed. There has been reported an excess of cancer cases in copper smelting industry, although copper sulfate is not generally considered carcinogenic.

$LD_{LO} = 1.088 \text{ mg(hydrate)/kg (human, oral)}$

$LD_{LO} = 50 \text{ mg/kg(anhydrous)/kg (human,oral)}$

$LD_{50} = 300 \text{ mg/kg (rat, oral)}$

Section IV - PHYSICAL DATA

BOILING POINT: 1207°F (decomposes)

MELTING POINT: 302°F (dehydrates)

VAPOUR DENSITY (AIR = 1): n.ap.

VAPOUR PRESSURE (MM HG 20°C): n.ap.

SOLUBILITY IN WATER: 30%

SPECIFIC GRAVITY (WATER = 1): 2.28

APPEARANCE AND ODOUR: Blue odourless crystalline powder

Section V - FIRE AND EXPLOSION HAZARDS

EXTINGUISHING MEDIA: This material is not combustible. Use any appropriate medium for extinguishing surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES & PRECAUTIONS: Fire fighters should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

UNUSUAL FIRE & EXPLOSION HAZARDS: none.

Section VI - REACTIVITY

STABILITY: stable

HAZARDOUS POLYMERIZATION: will not occur

CONDITIONS & MATERIALS TO AVOID: hydroxylamine

HAZARDOUS DECOMPOSITION PRODUCTS: will liberate toxic fumes of sulfur oxides

Section VII - EMPLOYEE PROTECTION

CONTROL MEASURES: Local mechanical exhaust ventilation should be used. An eyewash and shower should be ready for use.

RESPIRATORY PROTECTION: Wear an approved respirator appropriate for the dust concentration at the point of use.

PROTECTIVE CLOTHING: Long sleeved shirt, trousers, safety shoes, rubber gloves and rubber apron.

EYE PROTECTION: Chemical safety goggles should be worn, unless full face piece respirator is used. It is recognized that contact lenses should not be worn when working with chemicals as they may contribute to the severity of any injury.

Section VIII - ENVIRONMENTAL PROTECTION

ENVIRONMENTAL PRECAUTIONS: Local mechanical ventilation may be used.

SPILL OR LEAK PRECAUTIONS: Wear protective equipment including rubber boots, rubber gloves, rubber apron and self-contained breathing apparatus. If the spill or leak is small, a full facepiece respirator equipped with particulate filter is acceptable. Always wear eye protection. For small spills, sweep up and dispose of in an approved container. For large spills, shovel into approved container. Keep out of sewers, storm drains, surface waters and soil. Comply with governmental regulations concerning spill reporting and disposal of waste.

WASTE DISPOSAL: Dispose of contaminated product and materials in an approved manner. Seek the advice of a professional disposal service.

Section IX - REGULATORY CONTROLS

DEPT. OF TRANSPORTATION: Regulated under the Transport of Dangerous Goods Act.

DOT CLASSIFICATION: Class 9.2 U.N. 9109

DOT PROPER SHIPPING NAME: Cupric sulfate

OTHER DOT INFORMATION: Packing group II

WHMIS CLASSIFICATION: D2B

OTHER REGULATORY REQUIREMENT: none

Section X - PRECAUTIONS: HANDLING, STORAGE & USAGE

Store in a cool, dry, well-ventilated place away from incompatible materials. Keep bags dry at all times. Wash thoroughly after handling. Do not get in eyes, on skin or on clothing.

PREPARED BY: MSDS DEPARTMENT

DATE: Update January 9, 2002



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**BETZDEARBORN MATERIAL
SAFETY DATA SHEET**



EFFECTIVE DATE: 06-MAY-1998

PRINTED DATE: 01-JUN-1998

1) CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : DEARBORN 746

PRODUCT APPLICATION AREA: A BETZDEARBORN PRODUCT

COMPANY ADDRESS:

BetzDearborn Inc., Water Management Group
200 Witmd2 Road, Horsham, PA 19044
Information phone number: 215 773-6269

EMERGENCY TELEPHONE (HEALTH/ACCIDENT): (800)-877-1940 (USA)

2) COMPOSITION / INFORMATION ON INGREDIENTS

Information for specific product ingredients as required by the U.S. OSHA HAZARD COMMUNICATION STANDARD is listed. Refer to additional sections of this MSDS for our assessment of the potential hazards of this formulation.

HAZARDOUS INGREDIENTS:

CAS#

CHEMICAL NAME

113221-69-5

2-PROPENOIC ACID, ETHYL ESTER, POLYMER WITH ETHENYL
ACETATE AND 2,5-FURANDIONE, HYDROLYZED
Irritant (eyes and skin), possibly corrosive (eyes)

No component is considered to be a carcinogen by the National Toxicology Program, the International Agency for Research on Cancer, or the Occupational Safety and Health Administration at OSHA thresholds for carcinogens.

3) HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

WARNING

May cause moderate irritation to the skin. Severe irritant to the eyes, possibly corrosive. Mists/aerosols may cause irritation to upper respiratory tract.

DOT hazard: Corrosive to steel

Emergency Response Guide #154

Odor: Slight; Appearance: Light Yellow To Amber, Liquid

Fire fighters should wear positive pressure self-contained breathing apparatus(full face-piece type). Proper fire-extinguishing media: dry chemical, carbon dioxide, foam or water

POTENTIAL HEALTH EFFECTS

ACUTE SKIN EFFECTS:

May cause moderate irritation to the skin.

ACUTE EYE EFFECTS:

Severe irritant to the eyes, possibly corrosive.

ACUTE RESPIRATORY EFFECTS:

Mists/aerosols may cause irritation to upper respiratory tract.

INGESTION EFFECTS:

May cause gastrointestinal irritation with possible nausea, vomiting, abdominal discomfort and diarrhea.

TARGET ORGANS:

No evidence of potential chronic effects.

MEDICAL CONDITIONS AGGRAVATED:

Not known.

SYMPTOMS OF EXPOSURE:

Causes irritation of the skin, eyes, and/or respiratory system.

4) FIRST AID MEASURES

SKIN CONTACT:

Remove contaminated clothing. Wash exposed area with a large quantity of soap solution or water for 15 minutes.

EYE CONTACT:

Immediately flush eyes with water for 15 minutes. Immediately contact a physician for additional treatment.

INHALATION:

Remove victim from contaminated area to fresh air. Apply appropriate first aid treatment as necessary.

INGESTION:

Do not feed anything by mouth to an unconscious or convulsive victim. Do not induce vomiting. Immediately contact physician. Dilute contents of stomach using 3-4 glasses milk or water.

5) FIRE FIGHTING MEASURES

FIRE FIGHTING INSTRUCTIONS:

Fire fighters should wear positive pressure self-contained breathing apparatus (full face-piece type).

EXTINGUISHING MEDIA:

dry chemical, carbon dioxide, foam or water

HAZARDOUS DECOMPOSITION PRODUCTS:

Thermal decomposition (destructive fires) yields elemental oxides.

FLASH POINT:

> 200F > 93C P-M(CC)

MISCELLANEOUS:

Corrosive to steel

UN1760;Emergency Response Guide #154

6) ACCIDENTAL RELEASE MEASURES

PROTECTION AND SPILL CONTAINMENT:

Ventilate area. Use specified protective equipment. Contain and absorb on absorbent material. Place in waste disposal container. Flush area with water. Wet area may be slippery. Spread sand/grit.

DISPOSAL INSTRUCTIONS:

Water contaminated with this product may be sent to a sanitary sewer treatment facility, in accordance with any local agreement, a permitted waste treatment facility or discharged under a permit. Product as is - Incinerate or land dispose in an approved landfill.

7) HANDLING AND STORAGE

HANDLING:

Acidic. Do not mix with alkaline material.

STORAGE:

Keep containers closed when not in use. Protect from freezing. Do not store at elevated temperatures.

8) EXPOSURE CONTROLS/PERSONAL PROTECTION

CHEMICAL NAME EXPOSURE LIMITS

2-PROPENOIC ACID,ETHYL ESTER,POLYMER WITH ETHENYL ACETATE AND
2,5-FURANDIONE,HYDROLYZED
PEL (OSHA): NOT DETERMINED
TLV (ACGIH): NOT DETERMINED

ENGINEERING CONTROLS:

adequate ventilation

PERSONAL PROTECTIVE EQUIPMENT:

Use protective equipment in accordance with 29CFR 1910 Subpart I

RESPIRATORY PROTECTION:

A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR
1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER
WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

USE AIR PURIFYING RESPIRATORS WITHIN USE LIMITATIONS ASSOCIATED
WITH THE EQUIPMENT OR ELSE USE SUPPLIED AIR-RESPIRATORS.

If air-purifying respirator use is appropriate, use a
respirator with acid gas cartridges.

SKIN PROTECTION:

neoprene gloves-- Wash off after each use. Replace as
necessary.

EYE PROTECTION:

splash proof chemical goggles

9) PHYSICAL AND CHEMICAL PROPERTIES

Specific Grav. (70F,21C)	1.082	Vapor Pressure (mmHG)	~ 18.0
Freeze Point (F)	28	Vapor Density (air=1)	< 1.00
Freeze Point (C)	-2		
Viscosity(cps 70F,21C)	6	% Solubility (water)	100.0
Odor		Slight	
Appearance		Light Yellow To Amber	
Physical State		Liquid	
Flash Point	P-M(CC)	> 200F > 93C	
pH As Is (approx.)		1.0	
Evaporation Rate (Ether=1)		< 1.00	

NA = not applicable ND = not determined

10) STABILITY AND REACTIVITY

STABILITY:

Stable under normal storage conditions.

HAZARDOUS POLYMERIZATION:

Will not occur.

INCOMPATIBILITIES:

May react with strong oxidizers.

DECOMPOSITION PRODUCTS:

Thermal decomposition (destructive fires) yields elemental oxides.

BETZ INTERNAL PUMPOUT/CLEANOUT CATEGORIES:

"B"

11) TOXICOLOGICAL INFORMATION

Oral LD50 RAT:	>2,000 mg/kg
NOTE - Estimated value	
Dermal LD50 RABBIT:	>2,000 mg/kg
NOTE - Estimated value	

12) ECOLOGICAL INFORMATION

AQUATIC TOXICOLOGY

No Data Available.

BIODEGRADATION

COD (mg/gm):	275 Calculated
TOC (mg/gm):	99 Calculated
BOD-5 (mg/gm):	25 Calculated
BOD-28 (mg/gm):	25 Calculated

13) DISPOSAL CONSIDERATIONS

If this undiluted product is discarded as a waste, the US RCRA hazardous waste identification number is :
D002=Corrosive(pH, steel).

Please be advised; however, that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

14) TRANSPORT INFORMATION

DOT HAZARD:	Corrosive to steel
UN / NA NUMBER:	UN1760
DOT EMERGENCY RESPONSE GUIDE #:	154

15) REGULATORY INFORMATION

TSCA:

All components of this product are listed in the TSCA inventory.

CERCLA AND/OR SARA REPORTABLE QUANTITY (RQ):

No regulated constituent present at OSHA thresholds

SARA SECTION 312 HAZARD CLASS:

Immediate(acute)

SARA SECTION 302 CHEMICALS:

No regulated constituent present at OSHA thresholds

SARA SECTION 313 CHEMICALS:

No regulated constituent present at OSHA thresholds

CALIFORNIA REGULATORY INFORMATION

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65) CHEMICALS PRESENT:

No regulated constituent present at OSHA thresholds

MICHIGAN REGULATORY INFORMATION

No regulated constituent present at OSHA thresholds

)) OTHER INFORMATION

NFPA/HMIS

CODE TRANSLATION

Health	2	Moderate Hazard
Fire	1	Slight Hazard
Reactivity	0	Minimal Hazard
Special	CORR	No translation
(1) Protective Equipment	B	Goggles, Gloves

(1) refer to section 8 of MSDS for additional protective equipment recommendations.

CHANGE LOG

	EFFECTIVE DATE	REVISIONS TO SECTION:	SUPERCEDES
	-----	-----	-----
MSDS status:	08-JUL-1996		** NEW **
	24-DEC-1996		08-JUL-1996
	01-MAY-1997	2, 8	24-DEC-1996
	06-MAY-1998	; EDIT: 9	01-MAY-1997

Ciba Specialty Chemicals
USA

Additives

Ciba Specialty Chemicals Water Treatments, Inc.
2301 Wilroy Rd.
Suffolk, VA 23439-0820

8am to 5pm Phone: (757) 538-3700
24-Hour Health/Environmental Emergency Phone: 1-800-673-1138



Value beyond chemistry

Effective Date: 5/24/00

Material Safety Data Sheet

MSDS No: 15343

SECTION 1. PRODUCT IDENTIFICATION

Trade Name: MAGNAFLOC 455

Chemical Family: Copolymer of a quaternary acrylate salt and acrylamide.

Health	1
Flammability	1
Reactivity	0
Protective Equipment	X

HMIS RATING

Intended Use or Product Type: Flocculant

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

O S H A	CAS No.	CHEMICAL IDENTITY	EXPOSURE LIMITS					CARCINOGEN STATUS		
			ACGIH		OSHA		MFR.	IARC	NTP	OSHA
			TWA	STEL	PEL	STEL				
	124-04-9	ADIPIC ACID	5 mg/m3	NE	NE	NE	NE	NR	NR	NR
	69418-26-4	COPOLYMER ACRYLAMIDE; DMAEA Q.(McCl)	NE	NE	NE	NE	NE	NR	NR	NR

NE = Not Established NR = Not Reviewed

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview:

Description: White, free flowing powder with little or no odor.

Statement of Hazards: Eye irritant

Precautionary Measures: Do not get in eyes, on skin, on clothing. Wash thoroughly after handling. Avoid prolonged or repeated inhalation of dust or skin contact. Slip hazard when wet.

Primary Route(s) of Entry: Inhalation

Signs and Symptoms of Exposure: Contact with the eye may produce irritation and/or redness. Inhaled dust may cause some respiratory irritation.

Carcinogenicity: Not listed as a carcinogen by IARC, NTP, OSHA or ACGIH

Medical Conditions Aggravated by Exposure: Existing respiratory conditions.

Target Organ(s): Eyes, lungs

SECTION 4. FIRST AID MEASURES

Ingestion: Do not give an emetic unless directed by a physician. Never give anything by mouth to an unconscious person.

Skin: Remove contaminated clothing and launder before reuse. Wash effected area with soap and water.

Inhalation: Remove to fresh air.

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

SECTION 5. FIRE FIGHTING MEASURES

Flash Point:	Not Applicable
Autoignition:	Not Evaluated

Sensitivity to Mechanical Impact: None

Sensitivity to Static Discharge: Dust in sufficient concentration may result in an explosive mixture in air.

Fire Fighting Extinguishing Media: Carbon dioxide, dry chemical or foam.

Fire Fighting Equipment: No special procedures. However, wetted product presents a slip hazard. Pedestrian and vehicular traffic must proceed with caution where wet product may exist.

Fire and Explosion Hazards: Dust in sufficient concentration can result in an explosive mixture in air. Handle to minimize dusting, and eliminate open flame and other sources of ignition.

Hazardous Combustion Products: Oxides of carbon and nitrogen.

Combustibility: May burn in fire.

Dust Explosivity: Dust in sufficient concentration may result in an explosive mixture in air.

Emergency Response Guidebook Information: No ERG Guide cited. Handle as combustible material.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Accidental Release Measures: Product becomes slippery and difficult to handle when wet; spills are best handled while still dry. Sweep up and collect dry product. Absorb wet product with vermiculite or other inert material. Then water wash area to waste treatment to eliminate slip hazard.

SECTION 7. HANDLING AND STORAGE

Precautions: Good personal hygiene practices can reduce potential exposure. Wash with soap and water following any contact with this product, as well as before breaks and meals. Shower and change clothing at end of work shift. If clothing becomes contaminated, remove and launder or dry-clean before reuse.

Storage Information: Store in cool dry location.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Skin Protection: Not normally required.

Respiratory Protection: Use NIOSH approved dust respirator as required to control exposure. Follow ANSI Z88.2.

Eye Protection: Goggles (ANSI Z87.1 std; safety glasses alone do not protect from dust).

Engineering Controls: Provide mechanical ventilation to prevent dust concentrations, and to reduce potential exposure.

Additional Information: Provide eyewash station(s). Select additional protective equipment (eg apron, face shield, etc.), depending on conditions of use.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form:	Granular Powder
Color:	White
Odor:	Odorless
Odor Threshold:	Not applicable
Physical State:	Solid
Solubility in Water:	Soluble, solubility limited by viscosity
Vapor Pressure:	Not Applicable
Specific Gravity:	0.8 - 1
Boiling Point:	Not Applicable
Melting Point:	Not Applicable
Freezing Point:	Not Applicable
Decomposition Temperature:	Not Evaluated
Evaporation Rate:	Not Applicable
Vapor Density:	Not Applicable
VOC:	Not Applicable
pH:	~ 3.3 For 1 % solution.
Coefficient of water/oil:	Not Evaluated

Percent Volatile:
None expected above trace levels.

SECTION 10. STABILITY AND REACTIVITY

Conditions to Avoid: Avoid wet and humid conditions.

Stability: Stable.

Hazardous Polymerization: Will not occur.

Hazardous Decomposition Products: Thermal decomposition or combustion may produce oxides of carbon and nitrogen, various hydrocarbons, ammonia and/or hydrogen chloride vapor. Vapor may be irritating or harmful.

Incompatibility: Strong oxidants such as liquid chlorine, enriched gaseous or liquid oxygen, and sodium or calcium hypochlorite.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute Oral Toxicity:

Low oral toxicity. By analogy to similar materials, the acute LD50 (rat) is expected to be > 2000 mg/kg.

Carcinogenicity:

Not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

Reproductive Toxicity:

No data for product. No effects anticipated.

Teratogenicity:

No data for product. No effects anticipated.

Mutagenicity:

No data for product. No effects anticipated.

Skin Irritation:

57-13-6 UREA

Mild irritant.

Eye Irritation:

124-04-9 ADIPIC ACID

Severe.

Acute Eye Exposure Effects:

69418-26-4 COPOLYMER ACRYLAMIDE: DMAEA Q.(MeCl)

Product may cause temporary irritation which should cease upon removal of product. May require extensive irrigation to remove product from eye.

Sub-Chronic:

124-04-9 ADIPIC ACID

Male and female rats exposed to adipic acid in the form of aerosol dust (126 ug/L) for 6 hours a day for 15 days showed no signs of toxicity.

Intravenous LD 50:

124-04-9 ADIPIC ACID

LD50(Mice): 680 mg/kg.

Effective Date: 5/24/00

57-13-6 UREA

LD50(Rat): 5300 mg/kg.

LD50(Mice): 4600 mg/kg.

LD50(Rabbit): 4800 mg/kg.

Intraperitoneal LD 50:

124-04-9 ADIPIC ACID

LD50(Mice): 275 mg/kg.

Toxicologically Synergistic Products:

None known.

Additional Information:

57-13-6 UREA

LD50(Rat): 8200 mg/kg (Subcutaneous).

LD50(Mice): 8200 mg/kg (Subcutaneous).

SECTION 12. ECOLOGICAL INFORMATION

Ecological Information:

This product contains cationic polymer(s) that may be toxic to aquatic organisms when tested in pure (distilled) water. Toxicity is greatly reduced by particles in natural water.

Fish Toxicity:

124-04-9 ADIPIC ACID

24 hr LC50 (Bulegill sunfish): <330 mg/L.

96 hr LC50 (Fathead minnow): 97 mg/L.

69418-26-4 COPOLYMER ACRYLAMIDE: DMAEA Q.(MeCl)

Contains a cationic polyacrylamide. Cationic polyacrylamides are very toxic to aquatic organisms (LC50 values usually < 1 ppm); however, aquatic toxicity is reduced by factors of 10 to 100 times in the presence of 5 to 10 mg/l organic carbon as is found in most surface waters.

Bioaccumulation:

124-04-9 ADIPIC ACID

BCF = 0.68

SECTION 13. DISPOSAL CONSIDERATIONS

RCRA Hazard Class: This product, when unadulterated, is not a RCRA regulated hazardous waste.

Waste Disposal Method: Disposal must be arranged in accordance with local, state and federal regulations. Care must be taken to prevent environmental contamination from the disposal of material, residues and containers.

SECTION 14. TRANSPORT INFORMATION

DOT:

Proper Shipping Name:

NOT A DOT/IMO HAZARDOUS MATERIAL

SECTION 15. REGULATORY INFORMATION**US Federal Regulations:**

Chemical Weapons Convention (CWC): This product does not contain any chemicals listed under the Chemical Weapons Convention Schedules of Chemicals.

Clean Air Act -Hazardous Air Pollutants (HAP): The following chemical(s) are listed as hazardous air pollutants (HAP) under the U.S. Clean Air Act Section 12 (40 CFR 61):

Chemical Name: ACRYLAMIDE

CASRN: 79-06-1

Percent in Composition: <0.1% by wt

Clean Air Act - Ozone Depleting Substances (ODS): This product neither contains, nor was manufactured with, a Class I or Class II ozone depleting substance (ODS), as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App. A+B).

Clean Water Act - Priority Pollutants (PP): This product does not contain any priority pollutants listed under the U.S. Clean Water Act Section 307 (2)(1) Priority Pollutant List (40 CFR 401.15).

Occupational Safety and Health Act (OSHA): This product is considered to be a hazardous chemical under the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Resource Conservation and Recovery Act (RCRA): This product is not considered to be a P or U listed hazardous waste under RCRA (40 CFR 261).

SARA Title III: Section 302 - Extremely Hazardous Substances (EHS): This product contains the following chemicals regulated under Section 302 (40 CFR 355) as extremely hazardous substances:

Chemical Name: ACRYLAMIDE

CASRN: 79-06-1

Percent in Composition: <0.1 % by wt

SARA Title III: Section 304 - CERCLA: This product contains the following chemicals regulated under Section 304 (40 CFR 302) as hazardous substance(s) for emergency release notification ("CERCLA" List):

Chemical Name: ADIPIC ACID

CASRN: 124-04-9

Percent in Composition: <5% by wt

Component RQ: 5000

Chemical Name: ACRYLAMIDE

CASRN: 79-06-1

Percent in Composition: <0.10 % by wt

Component RQ: 5000

SARA Title III: Section 311/312 - Hazard Communication Standard (HCS): Acute health hazard.

SARA Title III: Section 313 Toxic Chemical List (TCL): This product does not contain any chemicals for routine annual toxic chemical release reporting under Section 313 (40 CFR 372).

Effective Date: 5/24/00

TSCA Section 5(e) - Consent Order / SNUR: This product is not subject to a Section 5(e) Consent Order or Significant New Use Rule (SNUR).

TSCA Section 8(b) - Inventory Status: All chemical(s) comprising this product are either exempt or listed on the TSCA inventory.

TSCA Section 12(b) - Export Notification: This product does not contain any chemical(s) that are subject to a Section 12(b) export notification.

State Regulations:

California Proposition 65: The following is required composition information. This product contains the following chemical(s) which are currently listed on the California list of Known Carcinogens and Reproductive Toxins:

Chemical Name: ACRYLAMIDE
CASRN: 79-06-1
Percent in Composition: < 0.10 % by wt

Massachusetts Right-to-Know: The following is required composition information:

Chemical Name: ADIPIC ACID
CASRN: 124-04-9
Percent in Composition: <5 % by wt

New Jersey Right-to-Know: The following is required composition information:

Chemical Name: ADIPIC ACID
CASRN: 124-04-9

Chemical Name: COPOLYMER ACRYLAMIDE; DMAEA Q.(MeCl)
CASRN: 69418-26-4

Chemical Name: WATER
CASRN: 7732-18-5

Chemical Name: UREA
CASRN: 57-13-6

Pennsylvania Right-to-Know: The following is required composition information:

Chemical Name: COPOLYMER ACRYLAMIDE; DMAEA Q.(MeCl)
CASRN: 69418-26-4
Comment: Not on Pennsylvania Hazardous Substance List

Chemical Name: WATER
CASRN: 7732-18-5
Comment: Not on Pennsylvania Hazardous Substance List

Chemical Name: ADIPIC ACID
CASRN: 124-04-9
Comment: Environmental Hazardous Substance

Effective Date: 5/24/00

MAGNAFLOC 455

Ciba Specialty Chemicals Water
Treatments, Inc

SECTION 16. OTHER INFORMATION

MSDS No:	15343
Reason Issued:	New format
Prepared By:	Leon Knight
Approved By:	
Supersedes Date:	03/24/99

Sections Modified: Tradename changed.

Disclaimer: The following supercedes Buyer's documents. SELLER MAKES NO REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, INCLUDING OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. No statements herein are to be construed as inducements to infringe any relevant patent. Under no circumstances shall Seller be liable for incidental, consequential or indirect damages for alleged negligence, breach of warranty, strict liability, tort or contract arising in connection with the product(s). Buyer's sole remedy and Seller's sole liability for any claims shall be Buyer's purchase price. Data and results are based on controlled or lab work and must be confirmed by Buyer by testing for its intended conditions of use. The product(s) has not been tested for, and is therefore not recommended for, uses for which prolonged contact with mucous membranes, abraded skin, or blood is intended; or for uses for which implantation within the human body is intended.



Material Safety Data Sheet

Page 1 of 8

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

HS DIESEL FUEL 2

PRODUCT NUMBER(S): CPS270010 CPS272102 CPS272152 CPS272185

COMPANY IDENTIFICATION

CHEVRON USA PRODUCTS COMPANY
ENVIRONMENTAL, SAFETY, AND HEALTH
ROOM 2900
575 MARKET ST.
SAN FRANCISCO, CA 94105-2856

EMERGENCY TELEPHONE NUMBERS

HEALTH (24 hr): (800)231-0623 or
(510)231-0623 (International)
TRANSPORTATION (24 hr): CHEMTREC
(800)424-9300 or (202)483-7616

PRODUCT INFORMATION: MSDS REQUEST: (415) 894-2783
ENVIRONMENTAL, SAFETY & HEALTH INFO.: (415) 894-1899
Product Information: (510) 242-5357

2. COMPOSITION/INFORMATION ON INGREDIENTS

100.0 % HS DIESEL FUEL 2

CONTAINING

COMPONENTS	AMOUNT	LIMIT/QTY	AGENCY/TYPE
DIESEL FUEL NO. 2			
Chemical Name: FUELS, DIESEL, NO. 2			
CAS68476346	100.0%	NONE	NA
HDS DISTILLATE, MIDDLE			
Chemical Name: DISTILLATES, HYDRODESULFURIZED MIDDLE			
CAS64742809		NONE	NA
GAS OIL, LIGHT			
Chemical Name: DISTILLATES, STRAIGHT RUN MIDDLE			
CAS64741442		NONE	NA

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NDA - No Data Available NA - Not Applicable

Prepared according to the OSHA Hazard Communication Standard
(29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Toxicology
and Health Risk Assessment Unit, CRTC, P.O. Box 4054, Richmond, CA 94804

KEROSENE

Chemical Name: Kerosine

CAS8008206

NONE

NA

HYDRODESULFURIZED Kerosine

Chemical Name: Kerosine, Hydrodesulfurized

CAS64742810

NONE

NA

CAT CRACKED DISTILLATE, LIGHT

Chemical Name: DISTILLATES, LIGHT CATALYTIC CRACKED

CAS64741599

NONE

NA

COMPOSITION COMMENT:

All the components of this material are on the Toxic Substances Control Act Chemical Substances Inventory.

TLV - Threshold Limit Value

STEL - Short-term Exposure Limit

RQ - Reportable Quantity

C - Ceiling Limit

A1-5 - Appendix A Categories

TWA - Time Weighted Average

TPQ - Threshold Planning Quantity

PEL - Permissible Exposure Limit

CAS - Chemical Abstract Service Number

() - Change Has Been Proposed

3. HAZARDS IDENTIFICATION

***** EMERGENCY OVERVIEW *****

Red liquid.

- COMBUSTIBLE
- HARMFUL OR FATAL IF SWALLOWED - CAN ENTER LUNGS AND CAUSE DAMAGE
- CAUSES SKIN IRRITATION
- CANCER HAZARD
- PROLONGED OR REPEATED SKIN CONTACT MAY INCREASE THE RISK OF SKIN CANCER
- KEEP OUT OF REACH OF CHILDREN

POTENTIAL HEALTH EFFECTS

EYE:

This substance is not expected to cause prolonged or significant eye irritation.

SKIN:

This substance is a moderate skin irritant so contact with the skin could cause prolonged (days) injury to the affected area. The degree of injury will depend on the amount of material that gets on the skin and the speed and thoroughness of the first aid treatment. If absorbed through the skin, this substance is considered practically non-toxic to internal organs.

INGESTION:

If swallowed, this substance is considered practically non-toxic to

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NDA - No Data Available

NA - Not Applicable

internal organs. Because of the low viscosity of this substance, it can directly enter the lungs if it is swallowed (this is called aspiration). This can occur during the act of swallowing or when vomiting the substance. Once in the lungs, the substance is very difficult to remove and can cause severe injury to the lungs and death.

INHALATION:

Prolonged breathing of vapors can cause central nervous system effects. This hazard evaluation is based on data from similar materials.

SIGNS AND SYMPTOMS OF EXPOSURE:

SKIN: May include pain or a feeling of heat, discoloration, swelling, and blistering. **INHALATION:** Central nervous system effects may include one or more of following: headache, dizziness, loss of appetite, weakness and loss of coordination.

CARCINOGENICITY:

This product contains a mixture of petroleum hydrocarbons called middle distillates (which means they boil between approximately 350F and 700F). Because of this broad description, many products are considered middle distillates yet they are produced by a variety of different petroleum refining processes. Toxicology data developed on some middle distillates found that they caused positive responses in some mutagenicity tests and caused skin cancer when repeatedly applied to mice over their lifetime. This product may contain some middle distillates found to cause those adverse effects.

4. FIRST AID MEASURES

EYE:

No first aid procedures are required. However, as a precaution flush eyes with fresh water for 15 minutes. Remove contact lenses if worn.

SKIN:

Remove contaminated clothing. Wash skin thoroughly with soap and water. See a doctor if any signs or symptoms described in this document occur. Discard contaminated non-waterproof shoes and boots. Wash contaminated clothing.

INGESTION:

If swallowed, give water or milk to drink and telephone for medical advice. DO NOT make person vomit unless directed to do so by medical personnel. If medical advice cannot be obtained, then take the person and product container to the nearest medical emergency treatment center or hospital.

INHALATION:

If any signs or symptoms as described in this document occur, move the person to fresh air. If any of these effects continue, see a doctor.

NOTE TO PHYSICIANS:

Ingestion of this product or subsequent vomiting can result in aspiration of light hydrocarbon liquid which can cause pneumonitis.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT: (P-M) 125F (52C) Min.

AUTOIGNITION: NDA

FLAMMABILITY LIMITS (% by volume in air): Lower: 0.6 Upper: 4.7

EXTINGUISHING MEDIA:

CO2, Dry Chemical, Foam and Water Fog.

NEPA RATINGS: Health 0; Flammability 2; Reactivity 0.

FIRE FIGHTING INSTRUCTIONS:

Liquid evaporates and forms vapor (fumes) which can catch fire and burn with explosive violence. Invisible vapor spreads easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches. Fire hazard is greater as liquid temperature rises above 85 F.

For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment. This may include self-contained breathing apparatus to protect against the hazardous effects of normal products of combustion or oxygen deficiency. Read the entire document.

COMBUSTION PRODUCTS:

Normal combustion forms carbon dioxide and water vapor; incomplete combustion can produce carbon monoxide.

6. ACCIDENTAL RELEASE MEASURES

CHEMTREC EMERGENCY NUMBER (24 hr): (800)424-9300 or (202)483-7616

ACCIDENTAL RELEASE MEASURES:

Eliminate all sources of ignition in vicinity of spill or released vapor.

Clean up small spills using appropriate techniques such as sorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Follow prescribed procedures for reporting and responding to larger releases. This material is considered to be a water pollutant and releases of this product should be prevented from contaminating soil and water and from entering drainage and sewer systems.

U.S.A. regulations require reporting spills of this material that could reach any surface waters. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802.

7. HANDLING AND STORAGE

DO NOT USE OR STORE near flame, sparks or hot surfaces. USE ONLY IN WELL VENTILATED AREA. Keep container closed.

DO NOT weld, heat or drill container. Replace cap or bung. Emptied container still contains hazardous or explosive vapor or liquid.

CAUTION! Do not use pressure to empty drum or drum may rupture with explosive force.

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NDA - No Data Available

NA - Not Applicable

WARNING! Not for use as portable heater or appliance fuel. Toxic fumes may accumulate and cause death.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS

Use this material only in well ventilated areas.

PERSONAL PROTECTIVE EQUIPMENT

EYE/FACE PROTECTION:

No special eye protection is usually necessary.

SKIN PROTECTION:

Avoid contact with skin or clothing. Skin contact should be minimized by wearing protective clothing including gloves.

RESPIRATORY PROTECTION:

No special respiratory protection is normally required. However, if operating conditions create high airborne concentrations, the use of an approved respirator is recommended.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL DESCRIPTION:

Red liquid.

pH:	NDA
VAPOR PRESSURE:	0.04 PSIA @ 40C
VAPOR DENSITY	
(AIR=1):	NDA
BOILING POINT:	176 - 370C (348-698F)
FREEZING POINT:	NDA
MELTING POINT:	NA
SOLUBILITY:	Soluble in hydrocarbon solvents; insoluble in water.
SPECIFIC GRAVITY:	0.84 @ 15.6/15.6C (Typical)
VISCOSITY:	1.9 cSt @ 40C (Min.)

10. STABILITY AND REACTIVITY

HAZARDOUS DECOMPOSITION PRODUCTS:

NDA.

CHEMICAL STABILITY:

Stable.

CONDITIONS TO AVOID:

No data available.

INCOMPATIBILITY WITH OTHER MATERIALS:

May react with strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

HAZARDOUS POLYMERIZATION:

Polymerization will not occur.

Revision Number: 19

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MSDS Number: 000525

NDA - No Data Available

NA - Not Applicable

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS:

Minimal effects clearing in less than 24 hours.

SKIN EFFECTS:

Moderate irritation at 72 hours. (Moderate erythema).

ACUTE ORAL EFFECTS:

The oral LD50 in rats is > 5 ml/kg.

ACUTE INHALATION EFFECTS:

The 4-hour inhalation LC50 in rats is greater than 5 mg/l.

SUBCHRONIC EFFECTS:

The data above is obtained from studies sponsored by the American Petroleum Institute (API).

Whole diesel engine exhaust was reviewed by the International Agency for Research on Cancer (IARC) in their Monograph 46 (1989). Evidence for causing cancer was considered sufficient in animals and limited in humans. IARC placed diesel exhaust in category 2A, considering it probably carcinogenic to humans.

The National Institute of Occupational Safety and Health (NIOSH) has recommended that whole diesel exhaust be regarded as potentially causing cancer. This recommendation was based on test results showing increased lung cancer in laboratory animals exposed to whole diesel exhaust. The excess risk of cancer for people exposed to diesel exhaust has not been determined as studies on exposed workers have been inconclusive. It is recommended that exposure to diesel exhaust be minimized to reduce the potential cancer risk.

12. ECOLOGICAL INFORMATION

ECOTOXICITY:

No data available.

ENVIRONMENTAL FATE:

No data available.

13. DISPOSAL CONSIDERATIONS

Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations. Contact local environmental or health authorities for approved disposal of this material.

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NDA - No Data Available NA - Not Applicable

14. TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT SHIPPING NAME: GAS OIL
DOT HAZARD CLASS: COMBUSTIBLE LIQUID
DOT IDENTIFICATION NUMBER: UN1202
DOT PACKING GROUP: III

15. REGULATORY INFORMATION

SARA 311 CATEGORIES:

1. Immediate (Acute) Health Effects:	YES
2. Delayed (Chronic) Health Effects:	YES
3. Fire Hazard:	YES
4. Sudden Release of Pressure Hazard:	NO
5. Reactivity Hazard:	NO

REGULATORY LISTS SEARCHED:

01=SARA 313	11=NJ RTK	22=TSCA Sect 5(a)(2)
02=MASS RTK	12=CERCLA 302.4	23=TSCA Sect 6
03=NTP Carcinogen	13=MN RTK	24=TSCA Sect 12(b)
04=CA Prop 65-Carcin	14=ACGIH TWA	25=TSCA Sect 8(a)
05=CA Prop 65-Repro Tox	15=ACGIH STEL	26=TSCA Sect 8(d)
06=IARC Group 1	16=ACGIH Calc TLV	27=TSCA Sect 4(a)
07=IARC Group 2A	17=OSHA PEL	28=Canadian WHMIS
08=IARC Group 2B	18=DOT Marine Pollutant	29=OSHA CEILING
09=SARA 302/304	19=Chevron TWA	30=Chevron STEL
10=PA RTK	20=EPA Carcinogen	

The following components of this material are found on the regulatory lists indicated.

KEROSENE

is found on lists: 02,10,11,

16. OTHER INFORMATION

NFPA RATINGS: Health 0; Flammability 2; Reactivity 0;
(Least-0, Slight-1, Moderate-2, High-3, Extreme-4). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

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NDA - No Data Available NA - Not Applicable

REVISION STATEMENT:

This revision updates Section 1 (Chemical Product and Company ID).

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modification of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

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NDA - No Data Available NA - Not Applicable



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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

CHEVRON REGULAR UNLEADED GASOLINE

PRODUCT NUMBER(S):

CPS201105	CPS201110	CPS201116	CPS201118
CPS201120	CPS201121	CPS201122	CPS201128
CPS201131	CPS201136	CPS201141	CPS201142
CPS201148	CPS201153	CPS201158	CPS201161
CPS201162	CPS201168	CPS201181	CPS201185
CPS201186	CPS201188	CPS201216	CPS201217
CPS201218	CPS201236	CPS201237	CPS201238
CPS201266	CPS201267	CPS201268	CPS201277
CPS201278	CPS201279	CPS201286	CPS201287
CPS201289	CPS201296	CPS201297	CPS201298
CPS241765	CPS255668		

SYNONYM: Calco Regular Unleaded Gasoline

COMPANY IDENTIFICATION

Chevron Products Company
575 Market St.
San Francisco, CA 94105-2856

EMERGENCY TELEPHONE NUMBERS

HEALTH (24 hr): (800)231-0623 or
(510)231-0623 (International)
TRANSPORTATION (24 hr): CHEMTREC
(800)424-9300 or (703)527-3887
Emergency Information Centers
are located in U.S.A.
Int'l collect calls accepted

PRODUCT INFORMATION: MSDS Requests and Product Information
(800) 689-3998

SPECIAL NOTES: This MSDS applies to: Federal Reformulated Gasoline,
California Reformulated Gasoline, Wintertime Oxygenated Gasoline,
Low RVP Gasoline and Conventional Gasoline.

2. COMPOSITION/INFORMATION ON INGREDIENTS

100.0 % CHEVRON REGULAR UNLEADED GASOLINE

CONTAINING

Revision Number: 22

Revision Date: 04/17/98

MSDS Number: 002655

COMPONENTS	AMOUNT	LIMIT/QTY	AGENCY/TYPE
GASOLINE (GENERIC)	100.00%	890 mg/m3 1480 mg/m3 2000 mg/m3	ACGIH TWA ACGIH STEL OSHA PEL
POTENTIALLY			
INCLUDING			
BENZENE			
Chemical Name: BENZENE			
CAS71432	< 4.90%	0.5 ppm 2.5 ppm 1 ppm 5 ppm 10 LBS	ACGIH TWA ACGIH STEL OSHA PEL OSHA CEILING CERCLA 302.4 RQ
Refer to the OSHA Benzene Standard (29 CFR 1910.1028) and Table Z-2 for detailed training, exposure monitoring, respiratory protection and medical surveillance requirements before using this product.			
ETHYL BENZENE			
Chemical Name: BENZENE, ETHYL-			
CAS100414		100 ppm 125 ppm 100 ppm 1,000 LBS	ACGIH TWA ACGIH STEL OSHA PEL CERCLA 302.4 RQ
XYLENE			
Chemical Name: BENZENE, DIMETHYL-			
CAS1330207		100 ppm 150 ppm 100 ppm 100 LBS	ACGIH TWA ACGIH STEL OSHA PEL CERCLA 302.4 RQ
TOLUENE			
Chemical Name: TOLUENE			
CAS108883		50 ppm 200 ppm 300 ppm 1,000 LBS	ACGIH TWA OSHA PEL OSHA CEILING CERCLA 302.4 RQ
N-BUTANE			
Chemical Name: N-BUTANE			
CAS106978		800 ppm	ACGIH TWA
N-HEPTANE			
Chemical Name: N-HEPTANE			
CAS142825		400 ppm 500 ppm 500 ppm	ACGIH TWA ACGIH STEL OSHA PEL

N-HEXANE

Chemical Name: N-HEXANE

CAS110543

50 ppm
500 ppm
5,000 LBSACGIH TWA
OSHA PEL
CERCLA 302.4 RQ

HEXANE ISOMERS (OTHER THAN N)

HEXANES

500 ppm
1000 ppmACGIH TWA
ACGIH STEL

PENTANE (ALL ISOMERS)

PENTANES

600 ppm
750 ppm
1000 ppmACGIH TWA
ACGIH STEL
OSHA PEL

CYCLOHEXANE

Chemical Name: CYCLOHEXANE

CAS110827

300 ppm
300 ppm
1,000 LBSACGIH TWA
OSHA PEL
CERCLA 302.4 RQ

METHYLCYCLOHEXANE

Chemical Name: CYCLOHEXANE, METHYL

CAS108872

400 ppm
500 ppmACGIH TWA
OSHA PEL

TRIMETHYLBENZENE

Chemical Name: BENZENE, TRIMETHYL-

CAS25551137

25 ppm

ACGIH TWA

2,2,4-TRIMETHYLPENTANE

Chemical Name: 2,2,4-TRIMETHYLPENTANE

CAS540841

1,000 LBS

CERCLA 302.4 RQ

CAN CONTAIN

METHYL TERT BUTYL ETHER (MTBE)

Chemical Name: 2-METHOXY-2-METHYL PROPANE

CAS1634044

< 15.00%

40 ppm
50 ppm
1,000 LBSACGIH TWA
Chevron STEL
CERCLA 302.4 RQ

ETHYL TERT BUTYL ETHER (ETBE)

Chemical Name: 2-ETHOXY-2-METHYL PROPANE

CAS637923

< 18.00%

NONE

NA

TERT-AMYL METHYL ETHER (TAME)

Chemical Name: 2-METHOXY-2-METHYL-BUTANE

CAS994058

< 17.00%

50 ppm

Chevron STEL

OR

ETHANOL

Chemical Name: ETHYL ALCOHOL

CAS64175

< 10.00%

1000 ppm

ACGIH TWA

1000 ppm

OSHA PEL

COMPOSITION COMMENT:

Motor gasoline is considered a mixture by EPA under the Toxic Substances Control Act (TSCA). The refinery streams used to blend motor gasoline are all on the TSCA Chemical Substances Inventory. The appropriate CAS number for refinery blended motor gasoline is 86290-81-5. The product specifications of motor gasoline sold in your area will depend on applicable Federal and State regulations. Ethyl Alcohol is only added in limited specific distribution areas.

3. HAZARDS IDENTIFICATION

******* EMERGENCY OVERVIEW *******

Colorless to yellow liquid

- EXTREMELY FLAMMABLE
- HARMFUL OR FATAL IF SWALLOWED - CAN ENTER LUNGS AND CAUSE DAMAGE
- VAPOR HARMFUL
- MAY CAUSE EYE AND SKIN IRRITATION
- LONG-TERM EXPOSURE TO VAPOR HAS CAUSED CANCER IN LABORATORY ANIMALS
- KEEP OUT OF REACH OF CHILDREN

***********POTENTIAL HEALTH EFFECTS****EYE:**

Contact with the eyes causes irritation. Eye contact with the vapors, fumes, or spray mist from this substance could also cause similar signs and symptoms.

SKIN:

Contact with the skin causes irritation. Not expected to be harmful to internal organs if absorbed through the skin. Prolonged or frequently repeated contact may cause the skin to become cracked or dry from the defatting action of this material.

INGESTION:

Because of the low viscosity of this substance, it can directly enter the lungs if it is swallowed (this is called aspiration). This can occur during the act of swallowing or when vomiting the substance. Once in the lungs, the substance is very difficult to remove and can cause severe injury to the lungs and death.

INHALATION:

May be harmful if inhaled. Breathing the vapors at concentrations above the recommended exposure standard can cause central nervous system effects. The vapor or fumes from this material may cause respiratory irritation.

SIGNS AND SYMPTOMS OF EXPOSURE:

Revision Number: 22

Revision Date: 04/17/98

MSDS Number: 002655

Eye damage or irritation: may include pain, tearing, reddening, swelling, and impaired vision. Skin injury: may include pain, discoloration, swelling, and blistering. Respiratory irritation: may include coughing and difficulty breathing. Central nervous system effects may include headache, dizziness, nausea, vomiting, weakness, loss of coordination, blurred vision, drowsiness, confusion, or disorientation. At extreme exposures, central nervous system effects may include respiratory depression, tremors or convulsions, loss of consciousness, coma or death.

CARCINOGENICITY:

Risk depends on duration and level of exposure. See Section 11 for additional information. Gasoline has been classified as a Group 2B carcinogen (possibly carcinogenic to humans) by the International Agency for Research on Cancer (IARC). Contains chemical(s) known to the State of California to cause cancer. Contains benzene, which has been classified as a carcinogen by the National Toxicology Program (NTP), and a Group 1 carcinogen (carcinogenic to humans) by the International Agency for Research on Cancer (IARC).

Whole gasoline exhaust was reviewed by the International Agency for Research on Cancer (IARC) in their Monograph Volume 46 (1989). Evidence for causing cancer was considered inadequate in animals and inadequate in humans. IARC placed whole gasoline exhaust in Category 2B, considering it possibly carcinogenic to humans.

4. FIRST AID MEASURES

EYE:

Flush eyes with water immediately while holding the eyelids open. Remove contact lenses, if worn, after initial flushing, and continue flushing for at least 15 minutes. Get medical attention if irritation persists.

SKIN:

Wash skin immediately with soap and water and remove contaminated clothing and shoes. Get medical attention if irritation persists. Discard contaminated clothing and shoes or thoroughly clean before reuse.

INGESTION:

If swallowed, give water or milk to drink and telephone for medical advice. DO NOT make person vomit unless directed to do so by medical personnel. If medical advice cannot be obtained, then take the person and product container to the nearest medical emergency treatment center or hospital.

INHALATION:

Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue.

NOTE TO PHYSICIANS:

Ingestion of this product or subsequent vomiting can result in aspiration of light hydrocarbon liquid which can cause pneumonitis.

5. FIRE FIGHTING MEASURES

FIRE CLASSIFICATION:

OSHA Classification (29 CFR 1910.1200): Flammable liquid. See section 7 for appropriate handling and storage conditions.

FLAMMABLE PROPERTIES:

FLASH POINT: (TCC) < -49F (<-45C)

AUTOIGNITION: NDA

FLAMMABILITY LIMITS (% by volume in air): Lower: 1.4 Upper: 7.6

EXTINGUISHING MEDIA:

Dry Chemical, CO₂, AFFF Foam or alcohol resistant foam if >15% volume polar solvents (oxygenates).

NFPA RATINGS: Health 1; Flammability 3; Reactivity 0.

FIRE FIGHTING INSTRUCTIONS:

Use water spray to cool fire-exposed containers and to protect personnel. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

COMBUSTION PRODUCTS:

Normal combustion forms carbon dioxide and water vapor; incomplete combustion can produce carbon monoxide.

6. ACCIDENTAL RELEASE MEASURES

CHEMTREC EMERGENCY NUMBER (24 hr): (800)424-9300 or (703)527-3887

International Collect Calls Accepted

ACCIDENTAL RELEASE MEASURES:

Eliminate all sources of ignition in the vicinity of the spill or released vapor.

Stop the source of the leak or release. Clean up releases as soon as possible, observing precautions in Exposure Controls/Personal Protection. Contain liquid to prevent further contamination of soil, surface water or groundwater. Clean up small spills using appropriate techniques such as sorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Follow prescribed procedures for reporting and responding to larger releases. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations. Contact local environmental or health authorities for approved disposal of this material.

This material is considered to be a water pollutant and releases of this product should be prevented from contaminating soil and water and from entering drainage and sewer systems. U.S.A. regulations require reporting spills of this material that could reach any surface waters. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802.

7. HANDLING AND STORAGE

This product presents an extreme fire hazard. Liquid very quickly evaporates, even at low temperatures, and forms vapor (fumes) which can catch fire and burn with explosive violence. Invisible vapor spreads.

easily and can be set on fire by many sources such as pilot lights, welding equipment, and electrical motors and switches.

Key operations which have the potential of generating a flammable atmosphere and/or static include tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing/agitation, and vacuum truck operations. To minimize the hazard of static electricity during these operations, bonding and grounding may be necessary but may not, by themselves, be sufficient. For more information, refer to OSHA Standard 29 CFR 1910.106, "Flammable and Combustible Liquids", National Fire Protection Association (NFPA) 77, "Recommended Practice on Static Electricity", and/or the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising Out of Static, Lighting, and Stray Currents".

Improper filling of portable gasoline containers creates danger of fire. Only dispense gasoline into approved and properly labeled gasoline containers. Always place portable containers on the ground. Be sure pump nozzle is in contact with the container while filling. Do not use a nozzle's lock-open device. Do not fill portable containers that are inside a vehicle or truck/trailer bed.

Never siphon gasoline by mouth. Use only as a motor fuel. Do not use for cleaning, pressure appliance fuel, or any other such use. DO NOT USE OR STORE near flame, sparks or hot surfaces. USE ONLY IN WELL VENTILATED AREA. Keep container closed. READ AND OBSERVE ALL PRECAUTIONS ON PRODUCT LABEL.

Do not use pressure to empty drum or drum may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner, or properly disposed of.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS

Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below the recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

EYE/FACE PROTECTION:

No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

SKIN PROTECTION:

No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances. Suggested materials for protective gloves include: <Nitrile> <Polyurethane> <Viton> <Chlorinated Polyethylene (or Chlorosulfonated Polyethylene or CPE)>

RESPIRATORY PROTECTION:

Determine if airborne concentrations are below the recommended exposure limits. If not, select a NIOSH/MSHA approved respirator that provides adequate protection from measured concentrations of this material. Use the following element(s) for air-purifying respirators: Organic Vapor. Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, exposure levels are not known, or other circumstances where air-purifying respirators may not provide adequate protection.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL DESCRIPTION:

Colorless to yellow liquid

pH: NDA
VAPOR PRESSURE: 5 - 15 PSI @ 100F (REID)
VAPOR DENSITY
(AIR=1): 3-4
BOILING POINT: 25 - 225C
FREEZING POINT: NDA
MELTING POINT: NA
SOLUBILITY: Soluble in hydrocarbons; insoluble in water.
SPECIFIC GRAVITY: 0.7 - 0.8 @ 15.6/15.6C
EVAPORATION RATE: NDA
PERCENT VOLATILE
(VOL): 99+%

10. STABILITY AND REACTIVITY

HAZARDOUS DECOMPOSITION PRODUCTS:

None known

CHEMICAL STABILITY:

Stable.

CONDITIONS TO AVOID:

See section 7.

INCOMPATIBILITY WITH OTHER MATERIALS:

May react with strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

HAZARDOUS POLYMERIZATION:

Polymerization will not occur.

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS:

The mean 24-hour Draize eye irritation score in rabbits is 0.

SKIN EFFECTS:

This material was not a skin sensitizer in the modified Buehler Guinea Pig Sensitization Test. For a 4-hour exposure, the Primary Irritation Index (PII) in rabbits is: 4.8

ACUTE ORAL EFFECTS:

The oral LD50 in rats is > 5 ml/kg.

ACUTE INHALATION EFFECTS:

No product toxicology data available.

ADDITIONAL TOXICOLOGY INFORMATION:

When vapor exposures are low, or short duration and infrequent, such as during refuelling and tanker loading/unloading, neither total hydrocarbon nor components such as benzene are likely to result in any adverse health effects. In situations such as accidents or spills where exposure to gasoline vapor and liquid is potentially high, attention should be paid to potential toxic effects of specific components in addition to those of total hydrocarbons. Information about specific components in gasoline are found in Section 1 and Section 15 of this MSDS. More detailed information on the health hazard of specific gasoline components can be obtained from the Chevron Emergency Information Center (see Section 1 for telephone numbers).

A study was done in which ten volunteers were exposed for 30 minutes to about 200, 500 or 1000 ppm concentrations of the vapor of three different unleaded gasolines. Irritation of the eyes was the only significant effect observed, based on both subjective and objective assessments.

An inhalation study with rats exposed to 0, 400 and 1600 ppm of wholly vaporized unleaded gasoline, 6 hours per day on day 6 through 16 of gestation, showed no teratogenic effects nor indication of toxicity to either the mother or the fetus (sex ratio, embryotoxicity, fetal growth and development).

An inhalation study with pregnant rats exposed to 0, 1000, 3000, and 9000 ppm of unleaded gasoline vapor, 6 hours per day on days 6 through 20 of gestation, showed no teratogenic effects nor indications of toxicity to either the mother or the fetus.

In an inhalation study, groups of 6 Fischer rats (3 male, 3 female) were exposed to 2056 ppm of wholly vaporized unleaded gasoline for 6 hours per day, 5 days per week for up to 18 months. Histopathology of the peripheral nervous system and spinal cord revealed no distal axonal neuropathy of the type associated with exposure to n-hexane even though gasoline contained 1.9% n-hexane. The authors concluded that gasoline treatment may have amplified the incidence and prominence of some naturally occurring age related changes in the nervous system.

Wholly vaporized unleaded gasoline was used in a 3 month inhalation study. Groups of 40 rats (20 males, 20 female) and 8 squirrel monkeys (4 male, 4 female) were exposed 6 hours per day and 5 days per week for 13 weeks to 384 or 1552 ppm gasoline. One group of each species served as unexposed controls. The initial conclusion of this study was that inhalation of gasoline at airborne concentrations of up to 1522 ppm caused no toxicity in rats or monkeys. However, further histopathological examination of male rat kidneys on the highest dose group revealed an increased incidence and severity of regenerative epithelium and dilated tubules containing proteinaceous deposits.

Rabbits were exposed to unleaded gasoline 24 hours per day, 5 days per week for two weeks; 0, 2.5, 5 or 8 ml were applied to the skin under an

occlusive dressing. Applied in such a way, this motor gasoline was corrosive to the rabbit skin and animals in all dose groups had decreased bodyweights. The slight and/or isolated systemic effects noted in the study were judged to be not significant.

Unleaded gasoline was assayed for mutagenic and cytogenetic activity. Gasoline was not mutagenic, either with or without activation, in Ames assay (*Salmonella typhimurium*), *Saccharomyces cerevisiae*, or mouse lymphoma assays. In addition, point mutations were not induced in human lymphocytes exposed to gasoline in vivo. The gasoline was not mutagenic when tested in the mouse dominant lethal assay. Administration of gasoline to rats did not cause chromosomal aberrations in their bone marrow cells.

In a lifetime skin painting study, 50 male Swiss mice were treated with 0.05 ml of unleaded gasoline three times per week. Positive control groups were treated with benzo(a)pyrene in acetone; an untreated negative control group was also included. The repeated exposure to gasoline caused severe skin irritation, ulceration, hyperkeratosis and abscesses. There was no statistically significant increase in the incidence of skin tumors. Histopathology at the end of the study showed that unleaded gasoline did not increase the incidence of tumors in other organs.

Lifetime inhalation of wholly vaporized unleaded gasoline at 2056 ppm has caused increased liver tumors in female mice. The mechanism of this response is still being investigated but is thought to be an epigenetic process unique to the female mouse. This exposure also caused kidney damage and eventually kidney cancer in male rats. No other animal model studied has shown these adverse kidney effects and there is no physiological reason to believe that they would occur in man. EPA has concluded that the mechanism by which wholly vaporized unleaded gasoline causes kidney damage is unique to the male rat. The response in that species (kidney damage and cancer) should not be used in human risk assessment.

In their 1988 review of carcinogenic risk from gasoline, The International Agency for Research on Cancer (IARC) noted that, because published epidemiology studies did not include any exposure data, only occupations where gasoline exposure may have occurred were reviewed. These included gasoline service station attendants and automobile mechanics. IARC also noted that there was no opportunity to separate effects of combustion products from those of gasoline itself. Although IARC allocated gasoline a final overall classification of Group 2B, i.e. possibly carcinogenic to humans, this was based on limited evidence in experimental animals plus supporting evidence including the presence in gasoline of benzene and 1, 3-butadiene. The actual evidence for carcinogenicity in humans was considered inadequate.

To explore the health effects of workers potentially exposed to gasoline vapors in the marketing and distribution sectors of the petroleum industry, the American Petroleum Institute sponsored a cohort mortality, a nested case-control, and an exposure assessment study. Histories of exposure to gasoline were reconstructed for a cohort of more than 18,000 employees from four companies for the time period between 1946 and 1985. Data were analyzed based on length of employment, length of exposure, job

category, age at first exposure and estimated cumulative and peak exposures. Cumulative exposure was defined as the sum of products of TWA exposure and duration of exposure of each job in an employee's work history. Among cohort members, cumulative exposure ranged from 2 to 8,000 ppm-years. In general, long-term drivers at small terminals had the highest exposures, and short-term workers with "other terminal jobs" had the lowest. A peak exposure was defined as an episode in excess of 500 ppm lasting 15 to 90 minutes.

The results of the cohort study indicated that there was no increased mortality from either kidney cancer or leukemia among marketing and marine distribution employees who were exposed to gasoline in the petroleum industry, when compared to the general population. More importantly, based on internal comparisons, there was no association between mortality from kidney cancer or leukemia and various indices of gasoline exposure.

For acute myeloid leukemia (AML), a non-significant mortality increase was found in land-based terminal employees, but no trend was detected when the data were analyzed by various gasoline exposure indices. This non-significant excess was limited to land-based terminal employees hired prior to 1948. On the other hand, a deficit of mortality from AML was observed among marine employees.

In addition to the cohort study, a subsequent nested case-control study was also conducted. Four diseases were selected for analysis in the case-control study: Leukemia (all cell types), AML, kidney cancer and multiple myeloma. For each case, five individually matched controls were randomly selected from the cohort. In the original cohort study, broad generic job categories were used as part of exposure assessment. In the case-control study, a finer and more homogeneous job classification was developed. In addition to job category, several quantitative gasoline exposure indices were used in the case-control analysis: length of exposure, cumulative exposure (ppm-years in terms of total hydrocarbons) and frequency of peak exposure. Time period of first exposure to gasoline (1948 or before and 1949 or after) was also included as an exposure index. Results of the nested case-control study confirmed the findings of the original cohort study. That is, exposure to gasoline at the levels experienced by this cohort of distribution workers is not a significant risk factor for leukemia (all cell types), acute myeloid leukemia, kidney cancer or multiple myeloma.

12. ECOLOGICAL INFORMATION

ECOTOXICITY:

Gasoline studies have been conducted in the laboratory under a variety of test conditions with a range of fish and invertebrate species. An even more extensive database is available on the aquatic toxicity of individual aromatic constituents. The majority of published studies do not identify the type of gasoline evaluated, or even provide distinguishing characteristics such as aromatic content or presence of lead alkyls. As a result, comparison of results among studies using open and closed vessels, different ages and species of test animals and different gasoline types,

is difficult.

The bulk of the available literature on gasoline relates to the environmental impact of monoaromatic (BTEX) and diaromatic (naphthalene, methylnaphthalenes) constituents. In general, non-oxygenated gasoline exhibits some short-term toxicity to freshwater and marine organisms, especially under closed vessel or flow-through exposure conditions in the laboratory. The components which are the most prominent in the water soluble fraction and cause aquatic toxicity, are also highly volatile and can be readily biodegraded by microorganisms.

The 96-hour LC50 in rainbow trout (*Oncorhynchus mykiss*) is 2.7 mg/l (BTEX). The 48-hour LC50 in daphnia (*Daphnia magna*) is 3.0 mg/l (BTEX). The 96-hour LC50 in sheepshead minnow (*Cyprinodon variegatus*) is 8.3 mg/l (BTEX). The 96-hour LC50 in mysid shrimp (*Mysidopsis bahia*) is 1.8 mg/l (BTEX).

ENVIRONMENTAL FATE:

Following spillage, the more volatile components of gasoline will be rapidly lost, with concurrent dissolution of these and other constituents into the water. Factors such as local environmental conditions (temperature, wind, mixing or wave action, soil type, etc), photo-oxidation, biodegradation and adsorption onto suspended sediments, can contribute to the weathering of spilled gasoline. The aqueous solubility of non-oxygenated unleaded gasoline, based on analysis of benzene, toluene, ethylbenzene+xylenes and naphthalene, is reported to be 112 mg/l. Solubility data on individual gasoline constituents also available.

13. DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible.

This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by USEPA under RCRA (40CFR261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

14. TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT SHIPPING NAME: GASOLINE
DOT HAZARD CLASS: 3 (FLAMMABLE LIQUID)
DOT IDENTIFICATION NUMBER: UN1203
DOT PACKING GROUP: II

15. REGULATORY INFORMATION

SARA 311 CATEGORIES:

1. Immediate (Acute) Health Effects:	YES
2. Delayed (Chronic) Health Effects:	YES
3. Fire Hazard:	YES
4. Sudden Release of Pressure Hazard:	NO
5. Reactivity Hazard:	NO

REGULATORY LISTS SEARCHED:

01=SARA 313	11=NJ RTK	22=TSCA Sect 5(a)(2)
02=MASS RTK	12=CERCLA 302.4	23=TSCA Sect 6
03=NTP Carcinogen	13=MN RTK	24=TSCA Sect 12(b)
04=CA Prop 65-Carcin	14=ACGIH TWA	25=TSCA Sect 8(a)
05=CA Prop 65-Repro Tox	15=ACGIH STEL	26=TSCA Sect 8(d)
06=IARC Group 1	16=ACGIH Calc TLV	27=TSCA Sect 4(a)
07=IARC Group 2A	17=OSHA PEL	28=Canadian WHMIS
08=IARC Group 2B	18=DOT Marine Pollutant	29=OSHA CEILING
09=SARA 302/304	19=Chevron TWA	30=Chevron STEL
10=PA RTK	20=EPA Carcinogen	

The following components of this material are found on the regulatory lists indicated.

BENZENE, ETHYL-

is found on lists: 01,02,10,11,12,13,14,15,17,26,28,

N-BUTANE

is found on lists: 02,10,11,13,14,28,

CYCLOHEXANE, METHYL

is found on lists: 02,10,11,13,14,17,26,28,

TOLUENE

is found on lists: 01,02,05,10,11,12,13,14,17,28,29,

N-HEXANE

is found on lists: 01,02,10,11,12,13,14,17,27,28,

CYCLOHEXANE

is found on lists: 01,02,10,11,12,13,14,17,26,28,

BENZENE, DIMETHYL-

is found on lists: 01,02,10,11,12,13,14,15,17,

N-HEPTANE

is found on lists: 02,10,11,13,14,15,17,26,28,

2-METHOXY-2-METHYL PROPANE

is found on lists: 01,02,10,11,12,14,24,26,27,30,

BENZENE, TRIMETHYL-

is found on lists: 02,10,11,13,14,26,28,

2,2,4-TRIMETHYLPENTANE

is found on lists: 02,10,11,12,26,

2-ETHOXY-2-METHYL PROPANE

is found on lists: 25,26,

ETHYL ALCOHOL

is found on lists: 02,10,11,13,14,17,28,

BENZENE

is found on lists: 01,02,03,04,06,10,11,12,13,14,15,17,20,28,29

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Revision Date: 04/17/98

MSDS Number: 002655

2-METHOXY-2-METHYL-BUTANE

is found on lists: 24,25,26,27,30,

GASOLINE (GENERIC)

is found on lists: 04,08,14,15,17,

PENTANES

is found on lists: 14,15,17,

HEXANES

is found on lists: 14,15,

WHMIS CLASSIFICATION:

Class B, Division 2: Flammable Liquids

Class D, Division 2, Subdivision A: Very Toxic Material

-Carcinogenicity

Class D, Division 2, Subdivision B: Toxic Material

-Skin or Eye Irritation

16. OTHER INFORMATION**NFPA RATINGS: Health 1; Flammability 3; Reactivity 0;****HMIS RATINGS: Health 1; Flammability 3; Reactivity 0;**

(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

REVISION STATEMENT:

Major changes have been made throughout this Material Safety Data sheet. Please read the entire document.

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	TPQ - Threshold Planning Quantity
RQ - Reportable Quantity	PEL - Permissible Exposure Limit
C - Ceiling Limit	CAS - Chemical Abstract Service Number
Al-5 - Appendix A Categories	() - Change Has Been Proposed
NDA - No Data Available	NA - Not Applicable

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Toxicology and Health Risk Assessment Unit, CRTC, P.O. Box 1627, Richmond, CA 94804

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modification of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination

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of the suitability of the material for his particular purpose.

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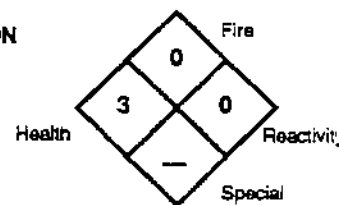
MATERIAL SAFETY DATA SHEET



GREAT WESTERN CHEMICAL COMPANY

NFPA 704 DESIGNATION
HAZARD RATING

4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Insignificant



ISSUE DATE: 12/12/95

SUPERSEDES: 03/23/94

GREAT WESTERN MSDS NUMBER: 39297

1. CHEMICAL PRODUCT IDENTIFICATION & COMPANY IDENTIFICATION

PRODUCT IDENTIFIER: MURIATIC ACID, 20° BAUME

GENERAL USE: Used in the production of chlorides; pickling and cleaning of metal products; as a catalyst and solvent in organic syntheses; and removing scale from boilers and heat-exchange equipment.

PRODUCT DESCRIPTION: An inorganic acid. Synonyms include: chlorohydric acid, hydrochloride, hydrogen chloride, muriatic acid and spirits of salt.

INFORMATION PROVIDED BY: GREAT WESTERN CHEMICAL COMPANY
Corporate Office
808 S.W. 15th Avenue
Portland, OR 97205
PHONE: 503-228-2600 FAX: 503-221-5767

EMERGENCY PHONE NUMBERS

GREAT WESTERN: 800-GW-SPILL
CHEMTREC: 800-424-9300
CANUTEC: 613-996-6666

2. COMPOSITION & INFORMATION ON INGREDIENTS

COMPONENT	CAS #	OSHA HAZARD	WL%	ACGIH TLV (TWA)	STEL	OSHA PEL (TWA)	STEL
Hydrochloric acid	007647-01-0	Corrosive, Lung toxin	31.4 Minimum	None Ceiling: 5 ppm	None	None Ceiling: 5 ppm	None

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

A clear, colorless liquid with a very strong pungent odor. Vapors, mists and liquid may cause severe irritation or burns to eyes, skin and respiratory tract. The NIOSH I.D.L.H. for hydrochloric acid is: 100 ppm.

POTENTIAL HEALTH EFFECTS:

INHALATION: Exposure to vapors or mists may cause severe irritation or burns to the respiratory tract. Symptoms of exposure may include: burning, choking and coughing. Inhalation of high concentrations may result in permanent lung damage.

EYE CONTACT: Exposure to vapors, mists or liquid may cause severe eye irritation or burns. Symptoms of exposure may include: pain, redness, watering, and swelling. Direct contact with the liquid will be corrosive to the eye. Exposure may cause corneal damage and visual impairment.

SKIN CONTACT: Exposure to vapors, mists or liquid may cause severe skin irritation or burns. Symptoms of exposure may include: pain, redness, swelling and scab formation. Direct contact with liquid will be corrosive to the skin. No published reports indicate this product is absorbed through the skin.

INGESTION: Ingestion may cause severe irritation or burns to the gastrointestinal tract. Symptoms of exposure may include: nausea, vomiting, diarrhea, abdominal pain, bleeding and/or tissue ulceration. Death may result due to esophageal or gastric necrosis.

CHRONIC: Prolonged or repeated exposure to this product may cause: dental discoloration, erosion of the teeth, impairment of lung function and permanent lung damage.

CONTINUED ON PAGE 2

4. FIRST AID MEASURES

- INHALATION:** If inhaled, immediately move to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; use the Holger Nielsen method (back pressure-arm-lift) or proper respiratory medical device. If breathing is difficult, give oxygen. Call a physician.
- EYE CONTACT:** In case of contact, immediately flush eyes with plenty of clean running water for at least 15 minutes, lifting the upper and lower lids occasionally. Remove contact lenses, if worn. Get medical attention immediately.
- SKIN CONTACT:** In case of contact, immediately flush skin with plenty of clean running water for at least 15 minutes, while removing contaminated clothing and shoes. If burn or irritation occurs, call a physician.
- INGESTION:** If swallowed, **DO NOT** induce vomiting. Get medical attention immediately. If victim is fully conscious, give plenty of water to drink. Never give anything by mouth to an unconscious person.

NOTE TO PHYSICIANS: The hazard associated with exposure to this material is the corrosive effect on mucous membranes. Exposure above the ACGIH-TLV may damage the respiratory tract. At high concentrations severe breathing difficulties may occur which may be delayed in onset and may be due to pulmonary edema (fluid in the lung) or laryngeal edema or spasm. Treat exposure symptomatically.

5. FIRE FIGHTING MEASURES

Flashpoint and Method: None

Flammable Limits (in air, % by volume): Lower: Not applicable Upper: Not applicable

Autoignition Temperature: Not applicable

GENERAL HAZARD: The Uniform Fire Code health hazard rating for this product is: **Corrosive (Acidic)**. Solutions of this material may be corrosive and may evolve flammable hydrogen gas on contact with most metals. May release chlorine gas by reaction with oxidizing agents.

FIRE FIGHTING INSTRUCTIONS: **EXTINGUISHING MEDIA:** Water, foam, CO₂ and dry chemicals.
Use water to cool containers exposed to fire.

FIRE FIGHTING EQUIPMENT: Fire fighters should wear full protective equipment, including self-contained breathing apparatus.

HAZARDOUS COMBUSTION PRODUCTS: When heated to dryness and thermal decomposition, material emits very toxic fumes of HCl and Cl₂.

6. ACCIDENTAL RELEASE MEASURES

LAND SPILL: Wearing recommended protective clothing, dike spill using soil, sand or compatible commercial absorbent. Neutralize acid using lime or a lime based agent compatible with this product. Pick up bulk of liquid using pumps or vacuum truck or absorb liquid in sand or commercial absorbent. Place in approved containers for disposal. Flush spill area with water, collect rinsates and containerize for disposal. Prevent run-off from contaminating sewers, streams or other bodies of water.

WATER SPILL: This material is completely soluble in water. Stop or divert water flow. Dike contaminated water and remove for disposal and/or treatment. Notify all downstream users of possible contamination.

7. HANDLING AND STORAGE**STORAGE TEMPERATURE:** Below 38° C. (100° F)**STORAGE PRESSURE:** Ambient

GENERAL: Store in a cool, dry area away from incompatible material. Do not store in direct sunlight. Store above freezing point. Protect eyes, skin, and clothing from contact with product. Wear recommended protective equipment. Avoid breathing vapors, mists or aerosols. Use only with adequate ventilation. Do not mix this product with concentrated alkalis. Always add product to water with adequate mixing as spattering can occur and heat will be generated. Never allow product solutions to contact aluminum, magnesium or zinc surfaces as this results in corrosion and generation of flammable/explosive hydrogen gas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

CONTROL MEASURES: Use local mechanical exhaust ventilation capable of maintaining emissions in the work area below the OSHA or ACGIH Ceiling limit.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT:

RESPIRATOR: For exposure above the OSHA or ACGIH Ceiling limit, wear a NIOSH-approved full facepiece or half mask air-purifying cartridge respirator equipped with an acid gas cartridge or supplied air.

EYES: Wear chemical goggles (recommended by ANSI Z87.1-1979) or face shield, unless a full facepiece respirator is worn.

GLOVES: Neoprene or butyl rubber gloves.

CLOTHING & EQUIPMENT: Wear a neoprene or butyl rubber apron or full protective clothing when handling product. An eye wash station and safety shower should be available in the work area.

FOOTWEAR: Neoprene or butyl rubber boots.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear, colorless	Bulk Density (pounds/ft³):	Not applicable
Physical State:	Liquid	Vapor Pressure:	About 13 mm Hg @ 20° C.
Odor:	Strong pungent	Vapor Density (air=1):	1.3 (HCl gas)
Odor Threshold:	1 ppm in air (HCl)	Evaporation Rate (n-Butyl Acetate=1):	Approximately 1
Molecular Formula:	HCl (in water)	VOC Content:	Not applicable
Molecular Weight:	36.46 (in water)	% Volatile:	100
Boiling Point:	Approximately 80° C. (176° F.)	Solubility in H₂O:	Complete
Freezing/Melting Point:	Less than 0° C. (32° F.)	Octanol/Water Partition Coefficient:	No data available
Specific Gravity:	1.1563 @ 20° C.	pH (as is):	Less than 1
Density (pounds/gallon):	9.64	pH (1% solution):	Less than 1.3

10. STABILITY AND REACTIVITY

GENERAL: This product is stable and hazardous polymerization will not occur.

CONDITIONS TO AVOID: Avoid excess heat. Avoid contact with alkaline materials and reactive metals.

INCOMPATIBLE MATERIAL: Contact with reactive metals (e.g. mild steel, aluminum, magnesium and zinc) may produce flammable/explosive hydrogen and air mixtures. Reacts violently with strong alkalis (bases). Avoid contact with amines, cyanides, sulfides, and chlorine releasers.

HAZARDOUS DECOMPOSITION PRODUCTS: When heated to dryness and thermal decomposition, material will emit toxic fumes of HCl and Cl₂.

SENSITIVITY TO MECHANICAL IMPACT: This product is not sensitive to mechanical impact.

SENSITIVITY TO STATIC DISCHARGE: This product is not sensitive to static discharge.

CONTINUED ON PAGE 4

15. REGULATORY INFORMATIONComponents: Hydrochloric acid**OSHA**

Target Organs: Eyes, Skin, Lungs

Carcinogenic Potential:

Regulated by OSHA: No

Listed on NTP Report: No

IARC Listing: No

U.S. EPA Requirements**Release Reporting**

CERCLA (40 CFR 302):

Listed Substance: Yes

Reportable Quantity: 5,000 pounds

Category: D

RCRA Waste No.: None listed

Unlisted Substance: Not applicable

Reportable Quantity: Not applicable

Characteristic: Not applicable

RCRA Waste No.: Not applicable

SARA TITLE III

Section 302 & 303 (40 CFR 355)

Listed Substance: No

Reportable Quantity: Not applicable

Planning Threshold: Not applicable

Section 311 & 312 (40 CFR 370)

Hazard Categories (product): Fire: N Sudden Release of Pressure: N Reactive: N Acute Health: Y Chronic Health: Y

Planning Threshold: Not applicable

Section 313 (40 CFR 372)

Listed Toxic Chemical: Yes

Reporting Threshold: 10,000 pounds

U.S. TSCA STATUS

Listed (40 CFR 710): Yes

CANADIAN REGULATIONS

Controlled Product: Yes

WHMIS Hazard Symbols: Materials Causing Immediate and Serious Toxic Effect, Corrosive Material

WHMIS Class & Division: Class D.1A, E

Product Identification Number: UN1789

IDL Substance: Yes

Domestic Substance List: Yes

CEPA Priority List: Not listed

Carcinogenicity:

ACGIH Appendix A: Not listed

A1 Confirmed Human: Not applicable

A1 Suspected Human: Not applicable

IARC Group: Not listed

STATE REGULATIONS:

State of California

Safe Drinking Water and Toxins Enforcement Act, 1986

(Proposition 65)

Carcinogen: No

Reproductive Toxin: No

OTHER REGULATIONS:

State Right To Know Laws: MA, NJ

16. OTHER INFORMATION

EPA Registration number: Not Applicable
Approved Product Uses: Not Applicable

Special Notes:

Do not add this product to hypochlorite bleaches, chlorine sanitizers or chlorinated cleaners as this releases toxic, corrosive chlorine gas. Do not mix this product with concentrated alkalis. Always add product to water with adequate mixing as spattering can occur and heat will be generated. Never allow product solutions to contact aluminum, magnesium or zinc surfaces as this results in corrosion and generation of flammable/explosive hydrogen gas.

MSDS Revision Information:

Form Revision made 02/09/94

Information Revised This Issue Date:

Re-formatted with standard phrases

MSDS distributed by **Great Western Chemical Company**

Environmental Department

Phone: 800-547-1400 FAX: 503-221-5767

Prepared By:

David L. Bishop

Date Prepared:

December 12, 1995

This Material Safety Data Sheet is provided as an information resource only. It should not be taken as a warranty or representation for which Great Western Chemical Company assumes legal responsibility. While Great Western Chemical Company believes the information contained herein is accurate and compiled from sources believed to be reliable, it is the responsibility of the user to investigate and verify its validity. The buyer assumes all responsibility of using and handling the product in accordance with applicable federal, state, and local regulations.

Aslchem International Inc.

100-9451 Van Horne Way,
Richmond, B.C.,
Canada V6X 1W2

Material Safety Data Sheet

Material: LEAD NITRATE

UN number: 1469

24 Hours Emergency Telephone Number = call CANUTEC (613)996-6666 collect

Hazard Rating: National Fire Protection Association

4 = Extreme, 3 = High, 2 = Moderate, 1 = Slight, 0 = Insignificant, * = Chronic Health Hazard (See Sec. 6)

Fire = 1 Health = 0 Reactivity = 0 Special = oxy

SECTION 1. Identification of Product

Trade Name & Synonyms:

Lead Nitrate

Chemical Name & Synonyms:

Lead Nitrate

Chemical & Physical State: Solid, oxidizer

Molecular Formula: Pb(NO₃)₂**SECTION 2. Physical Properties**

Appearance & Odour:

White semi-transparent crystals

Boiling Point (degree C):

Decomposes at 470 degree C

Melting/Freezing Point (degree C):

Not applicable

Vapour Density (Air = 1):

Not applicable

Specific Gravity (water = 1 at 4 degree C):

4.53

Solubility in Water:

Soluble

Vapour Pressure (MM HG): Not applicable

Other Solvents: Slightly soluble in Alcohol

SECTION 3. Fire & Explosion Hazard Data

Flash Point (degree C) & Method:

Not applicable

Autoignition Temperature (degree C):

Not applicable

Flammable Limits (% by vol. in air):

Promotes combustion.

Lower:

Upper:

Would any material saturated with this product be subject to spontaneous combustion?

☒ X

Yes

☐ No

Materials: Easily oxidizable materials or very flammable materials.

Fire Extinguishing Data: Use flooding amounts of water to extinguish the fire.

Special Firefighting Procedures: Wear self-contained breathing apparatus.

Unusual Fire & Explosion Hazards: Releases toxic gaseous oxides of Nitrogen. When coming in contact with easily oxidizable materials, it may cause ignition, violent combustion or explosion. Promotes combustion of inflammables.

SECTION 4. Reactivity Data

Stability:

☒ X

Stable

☐ Unstable

Conditions to Avoid: Contact with other materials.

Incompatibility (materials to avoid): All oxidizable materials or inflammable organics. Reacts violently with Ammonium Thiocyanate, Carbon, Lead Hypophosphite.

Hazardous Decomposition Products: Toxic Nitrogen Oxides under fire conditions.

Aslchem International Inc.

100-9451 Van Horne Way,
Richmond, B.C.,
Canada V6X 1W2

Material Safety Data Sheet**Material: LEAD NITRATE****UN number: 1469****SECTION 4****CONT...****Hazardous Polymerization:**☐ May occur☒ X☐ Will not occur**SECTION 5****Health Hazard Data****Threshold Limit Value (TLV-TWA):**

0.15 mg/m3

LD50: Not available**Effects of Exposure When:**

Inhaled: Material contains lead which is a cumulative poison. May cause headaches, dizziness, nervousness, depression, numbness, aching muscles, weakness, laboured breathing, abdominal discomfort, nausea and vomiting.

In contact with eyes: Dust is an irritant which may cause redness, possible blurred vision.

In contact with skin: Irritant.

Ingested: See "Inhaled" for symptoms. Symptoms generally take a longer time to become prevalent when material is ingested rather than inhaled.

Emergency and First Aid Procedures:

Inhalation: Move patient to fresh air. If not breathing, give artificial respiration. Keep patient warm & at rest. Obtain medical attention.

Eyes: Flush eyes with running water for at least 20 minutes, holding eyelids open. If irritation persists obtain medical attention immediately.

Skin: Flush affected area with running water for at least 20 minutes. If irritation persists, obtain medical attention.

Ingestion: Unless unconscious or convulsing, give large amount of water to induce vomiting. Obtain medical attention immediately.

SECTION 6**Special Protection Information**

Ventilation Requirements: Local exhaust ventilation preferred.

Respiratory Protection: INOSH approved air-purifying respirator for concentrations up to 10 times TLV. Air supplied respirator for higher concentrations.

Protective Gloves: Rubber or cotton gloves.

Eye Protection: Safety glasses with side shields.

Other Protective Equipment: Face mask, overalls.

SECTION 7**Special Requirements**

Precaution in Handling and Storing:

Protect against physical damage. Store in a cool, dry place. Avoid storage on wood floors.

Other Precautions:

Separate from combustible, organic or other readily-oxidized materials.

SECTION 8**Spill or Leak Procedures**

Steps to be taken in event of spill or release (in all cases notify applicable Government Authority if spill is significant):

Stop & contain leak or spill. Sweep or shovel material into containers for reuse. Do not allow material to reach waterways.

Aschem International Inc.

100-9451 Van Horne Way,
Richmond, B.C.,
Canada V6X 1W2

Material Safety Data Sheet**Material: LEAD NITRATE****UN number: 1469****SECTION 8****CONT...**

Environmental Effects: May be toxic to aquatic life if exposed to materials for a long period of time thru small leaks or uncontained spills. Lead may accumulate in the ecosystem & become hazardous to man.

Neutralizing Chemicals: Add material to great amount of water and add Soda Ash. Neutralize with 6M HCL.

Waste Disposal: Consult federal, provincial & local regulations on chemical waste disposal. May be possible to dispose of in a secure, sanitary landfill site.

SECTION 9**Transport & Regulatory Information****Proper Shipping Name:** Lead Nitrate**Hazard Class :** 5.1(6.1)(9.2)**PIN :** UN1469**Packing Group:** II**WHMIS Classification:** C D. 1A D.2A**SECTION 10****References**

- 1) Eco Research Ltd., Hazardous Materials Spill Manual, Quebec, 1977.
- 2) NIOSH/OSHA, Occupational Health Guidelines for Chemical Hazards, DHHS (NIOSH) 1981.
- 3) Hygienic Guide Series, American Industrial Hygiene Association.

"Information contained herein is provided without any warranty, and Aschem International Inc. will not be liable for any damage which may result from the use or reliance on any information contained herein"



Material Safety Data Sheet

Page 1 of 8

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

CHEVRON Supreme Motor Oil

PRODUCT NUMBER(S): CPS220002 CPS220011 CPS220013 CPS220019
CPS220059 CPS220060

SYNONYM: CHEVRON Supreme Motor Oil SAE 10W-30
CHEVRON Supreme Motor Oil SAE 10W-40
CHEVRON Supreme Motor Oil SAE 20W-50
CHEVRON Supreme Motor Oil SAE 30
CHEVRON Supreme Motor Oil SAE 40
CHEVRON Supreme Motor Oil SAE 5W-30

COMPANY IDENTIFICATION

Chevron Products Company
Global Lubricants
555 Market St.
Room 803
San Francisco, CA 94105-2870

EMERGENCY TELEPHONE NUMBERS

HEALTH (24 hr): (800)231-0623 or
(510)231-0623 (International)
TRANSPORTATION (24 hr): CHEMTREC
(800)424-9300 or (703)527-3887
Int'l collect calls accepted

PRODUCT INFORMATION: MSDS Requests: (800) 228-3500
Environmental, Safety, & Health Info: (415) 894-0703
Product Information: (800) 582-3835

SPECIAL NOTES: This MSDS is for the entire line of CHEVRON Supreme Motor Oil.

2. COMPOSITION/INFORMATION ON INGREDIENTS

100.0 % CHEVRON Supreme Motor Oil

CONTAINING

COMPONENTS	AMOUNT	LIMIT/QTY	AGENCY/TYPE
LUBRICATING BASE OIL			
SEVERELY REFINED PETROLEUM DISTILLATE			
	> 75.00%	5 mg/m3 (mist)	ACGIH TWA
		10 mg/m3 (mist)	ACGIH STEL

Revision Number: 0

Revision Date: 06/07/97

MSDS Number: 006717

5 mg/m3 (mist) OSHA PEL

The BASE OIL may be a mixture of any of the following: CAS 64741884, CAS 64741895, CAS 64741964, CAS 64741975, CAS 64742014, CAS 64742525, CAS 64742536, CAS 64742547, CAS 64742627, CAS 64742650, or CAS 72623837.

MAY CONTAIN**SYNTHETIC HYDROCARBON BASE OIL**

Chemical Name: 1-DECENE, TRIMER, HYDROGENATED

CAS68649127

NONE

NA

SYNTHETIC HYDROCARBON BASE OIL

Chemical Name: 1-DECENE, HOMOPOLYMER, HYDROGENATED

CAS68037014

NONE

NA

ADDITIVES INCLUDING THE FOLLOWING

< 25.00%

ZINC ALKYL DITHIOPHOSPHATE

Chemical Name: PHOSPHORODITHIOIC ACID,O,O-DI-C1-14-ALKYL ESTERS, ZINC SALT

CAS68649423

< 1.75%

NONE

NA

COMPOSITION COMMENT:

All the components of this material are on the Toxic Substances Control Act Chemical Substances Inventory.

This product fits the ACGIH definition for mineral oil mist. The ACGIH TLV is 5 mg/m3, the OSHA PEL is 5 mg/m3.

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS**EYE:**

Not expected to cause prolonged or significant eye irritation.

SKIN:

Contact with the skin is not expected to cause prolonged or significant irritation. Not expected to be harmful to internal organs if absorbed through the skin.

INGESTION:

Not expected to be harmful if swallowed.

INHALATION:

Contains a petroleum-based mineral oil that may cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of airborne levels above the recommended exposure limit.

4. FIRST AID MEASURES

EYE:

Revision Number: 0

Revision Date: 06/07/97

MSDS Number: 006717

No specific first aid measures are required because this material is not expected to cause eye irritation. As a precaution remove contact lenses, if worn, and flush eyes with water.

SKIN:

No specific first aid measures are required because this material is not expected to be harmful if it contacts the skin. As a precaution, remove clothing and shoes if contaminated. Use a waterless hand cleaner, mineral oil, or petroleum jelly to remove the material. Then wash skin with soap and water. Wash or clean contaminated clothing and shoes before reuse.

INGESTION:

No specific first aid measures are required because this material is not expected to be harmful if swallowed. Do not induce vomiting. As a precaution, give the person a glass of water or milk to drink and get medical advice. Never give anything by mouth to an unconscious person.

INHALATION:

If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.

5. FIRE FIGHTING MEASURES

FIRE CLASSIFICATION:

Classification (29 CFR 1910.1200): Not flammable or combustible.

FLAMMABLE PROPERTIES:

FLASH POINT: (COC) 388-428F (198-220C) Min.

AUTOIGNITION: NDA

FLAMMABILITY LIMITS (% by volume in air): Lower: NA Upper: NA

EXTINGUISHING MEDIA:

CO2, Dry Chemical, Foam, Water Fog

NFPA RATINGS: Health 1; Flammability 1; Reactivity 0.

FIRE FIGHTING INSTRUCTIONS:

This material will burn although it is not easily ignited.

COMBUSTION PRODUCTS:

Normal combustion forms carbon dioxide, water vapor and may produce oxides of sulfur, nitrogen and phosphorus. Incomplete combustion can produce carbon monoxide.

6. ACCIDENTAL RELEASE MEASURES

CHEMTREC EMERGENCY NUMBER (24 hr): (800)424-9300 or (703)527-3887

International Collect Calls Accepted

ACCIDENTAL RELEASE MEASURES:

Stop the source of the leak or release. Clean up releases as soon as possible. Contain liquid to prevent further contamination of soil, surface water or groundwater. Clean up small spills using appropriate techniques such as sorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Follow prescribed procedures for reporting and responding to larger releases.

7. HANDLING AND STORAGE

Do not use pressure to empty drum or drum may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner, or properly disposed of. Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS

Use in a well-ventilated area. If user operations generate an oil mist, use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below the recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

EYE/FACE PROTECTION:

No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

SKIN PROTECTION:

No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances. Suggested materials for protective gloves include: <Viton> <Nitrile> <Silver Shield> <4H>

RESPIRATORY PROTECTION:

No special respiratory protection is normally required. If user operations generate an oil mist, determine if airborne concentrations are below the recommended exposure limits. If not, select a NIOSH/MSHA approved respirator that provides adequate protection from concentrations of this material. Use the following elements for air-purifying respirators: particulate.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL DESCRIPTION:

Amber liquid.

pH: NDA

VAPOR PRESSURE: NA

VAPOR DENSITY

(AIR=1): NA

BOILING POINT: NDA

FREEZING POINT: NDA

MELTING POINT: NA

SOLUBILITY: Soluble in hydrocarbon solvents; insoluble in water

Revision Number: 0

Revision Date: 06/07/97

MSDS Number: 006717

SPECIFIC GRAVITY: 0.87 - 0.89 @ 15.6/15.6C
VOLATILE ORGANIC
COMPOUNDS (VOC): <1 wt.%, 8.69 g/l (approx.)
EVAPORATION RATE: NA
VISCOSITY: 10.0 - 18.4 cSt @ 100C (Min.)
PERCENT VOLATILE
(VOL): NA

10. STABILITY AND REACTIVITY

HAZARDOUS DECOMPOSITION PRODUCTS:

No data available.

CHEMICAL STABILITY:

Stable.

CONDITIONS TO AVOID:

No data available.

INCOMPATIBILITY WITH OTHER MATERIALS:

May react with strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

HAZARDOUS POLYMERIZATION:

Polymerization will not occur.

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS:

The eye irritation hazard is based on data for a similar material.

SKIN EFFECTS:

The skin irritation hazard is based on data for a similar material.

ACUTE ORAL EFFECTS:

The acute oral toxicity is based on data for a similar material.

ACUTE INHALATION EFFECTS:

The acute respiratory toxicity is based on data for a similar material.

ADDITIONAL TOXICOLOGY INFORMATION:

This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, severe hydrocracking, or severe hydrotreating. None of the oils requires a cancer warning under the OSHA Hazard Communication Standard (29 CFR 1910.1200). These oils have not been listed in the National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as; carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), or possibly carcinogenic to humans (Group 2B).

This product contains synthetic base oils not refined from petroleum base stocks. The potential of base oil prepared by this process to cause cancer has not been specifically addressed by the OSHA Hazard Communication Standard (29 CFR 1910.1200), the International Agency for Research on Cancer (IARC), nor the National Toxicology Program (NTP) Annual Report. However, the process conditions, chemical analysis, and the results of mutagenicity tests all support our opinion that these oils should not cause skin cancer.

This product contains zinc alkyl dithiophosphates (ZDDPs). Several ZDDPs have been reported to have weak mutagenic activity in cultured mammalian cells but only at concentrations that were toxic to the test cells. We do not believe that there is any mutagenic risk to workers exposed to ZDDPs.

During use in engines, contamination of oil with low levels of cancer-causing combustion products occurs. Used motor oils have been shown to cause skin cancer in mice following repeated application and continuous exposure. Brief or intermittent skin contact with used motor oil is not expected to have serious effects in humans if the oil is thoroughly removed by washing with soap and water. See Chevron Material Safety Data Sheet No. 1793 for additional information on used motor oil.

12. ECOLOGICAL INFORMATION

ECOTOXICITY:

This material is not expected to be harmful to aquatic organisms.

ENVIRONMENTAL FATE:

This material is not expected to be readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Oil collection services and collection centers are available for used motor oil recycling or disposal. Some service stations, automotive service centers, and retailers provide motor oil collection facilities.

Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

14. TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT SHIPPING NAME: NOT DESIGNATED AS A HAZARDOUS MATERIAL BY THE
FEDERAL DOT

DOT HAZARD CLASS: NOT APPLICABLE

DOT IDENTIFICATION NUMBER: NOT APPLICABLE

DOT PACKING GROUP: NOT APPLICABLE

15. REGULATORY INFORMATION

SARA 311 CATEGORIES:

1. Immediate (Acute) Health Effects:	NO
2. Delayed (Chronic) Health Effects:	NO
3. Fire Hazard:	NO
4. Sudden Release of Pressure Hazard:	NO
5. Reactivity Hazard:	NO

REGULATORY LISTS SEARCHED:

01=SARA 313	11=NJ RTK	22=TSCA Sect 5(a)(2)
02=MASS RTK	12=CERCLA 302.4	23=TSCA Sect 6
03=NTP Carcinogen	13=MN RTK	24=TSCA Sect 12(b)
04=CA Prop 65-Carcin	14=ACGIH TWA	25=TSCA Sect 8(a)
05=CA Prop 65-Repro Tox	15=ACGIH STEL	26=TSCA Sect 8(d)
06=IARC Group 1	16=ACGIH Calc TLV	27=TSCA Sect 4(a)
07=IARC Group 2A	17=OSHA PEL	28=Canadian WHMIS
08=IARC Group 2B	18=DOT Marine Pollutant	29=OSHA CEILING
09=SARA 302/304	19=Chevron TWA	30=Chevron STEL
10=PA RTK	20=EPA Carcinogen	

The following components of this material are found on the regulatory lists indicated.

PHOSPHORODITHIOIC ACID, O,O-DI-CL-14-ALKYL ESTERS, ZINC SALTS

is found on lists: 01,11,

SEVERELY REFINED PETROLEUM DISTILLATE

is found on lists: 14,15,17,

EEC RISK AND SAFETY STATEMENTS:

May cause long-term adverse effects in the aquatic environment.

NEW JERSEY RTK CLASSIFICATION:

Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A. 34:5A-1 et. seq., the product is to be identified as follows:

PETROLEUM OIL

WHMIS CLASSIFICATION:

This product is not considered a controlled product according to the criteria of the Canadian Controlled Products Regulations.

16. OTHER INFORMATION

NFPA RATINGS: Health 1; Flammability 1; Reactivity 0;

HMIS RATINGS: Health 1; Flammability 1; Reactivity 0;

(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

REVISION STATEMENT:

This is a new Material Safety Data Sheet.

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	TPQ - Threshold Planning Quantity
RQ - Reportable Quantity	PEL - Permissible Exposure Limit
C - Ceiling Limit	CAS - Chemical Abstract Service Number
Al-5 - Appendix A Categories	() - Change Has Been Proposed
NDA - No Data Available	NA - Not Applicable

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Toxicology and Health Risk Assessment Unit, CRTC, P.O. Box 4054, Richmond, CA 94804

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modification of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

THIS IS THE LAST PAGE OF THIS MSDS

Ferrellgas

One Liberty Plaza • Liberty, MO 64068

MATERIAL SAFETY DATA SHEET PROPANE

Section I

Supplier's Name:
Ferrellgas

Address:
One Liberty Plaza
Liberty, Missouri 64068

24 Hour Emergency Telephone Number:
CHEMTREC 800 424-9300

Telephone Number for Information:
(816) 792-1600

Date Prepared:
6/01/93, replaces MSDS dated 10/01/89

Section II — Hazardous Ingredients/Identity Information

Hazardous Component:
Propane (74-98-6)

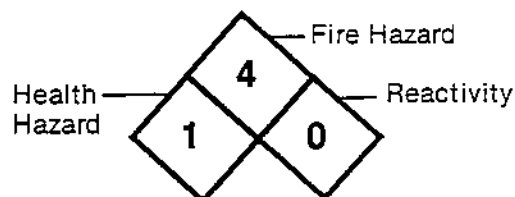
Exposure Limit:

ACGIH — Classed as a simple asphyxiant
OSHA PEL — 1,000 ppm, 1,800 mg/m³-8Hr TWA

Identity Information:

Chemical Name or Synonym: Liquefied Petroleum Gas
Chemical Family: Alkane Hydrocarbon
Chemical Formula: C₃H₈
Proper Shipping Name: Liquefied Petroleum Gas
Hazardous Classification: "Flammable Gas"
DOT Identification: UN 1075
Label(s) Required: Flammable Gas, Class 2.1

NFPA Hazard Rating



4 — Severe
3 — Serious
2 — Moderate
1 — Slight
0 — Minimal

Section III — Physical/Chemical Characteristics

Boiling Point: -44 °F

Vapor Pressure: 208 psig (max) @ 100 °F

Vapor Density (Air = 1): 1.52

Solubility in Water: Slightly

Liquid to Vapor Expansion Ratio: 1:270

Volatiles, % by Volume: 100

Specific Gravity (H₂O = 1): 0.51

Melting Point: N/A

Evaporation Rate (Butyl Acetate = 1): diffuses readily, < 1

Appearance and Odor: Clear, unpleasant odor similar to garlic (odorized by - Ethyl Mercaptan)

Molecular Weight: 44.096

Section IV — Fire and Explosion Hazard Data

Flash Point: -156 °F

Auto Ignition Temperature: 940 °F

LEL: 2.15% **UEL:** 9.60%

Extinguishing Media: Dry Chemical Class A-B-C, CO₂, Water Spray or Halon

Special Fire Fighting Procedures: Stop flow of gas. Use water to keep fire-exposed containers cool. Use water spray to disperse unignited gas or vapor. Use self-contained breathing apparatus in confined spaces. Evacuate area until gas dissipates completely.

Unusual Fire and Explosion Hazards: Flammable liquid and gas under pressure. May form explosive mixtures with air. Containers exposed to fire or excessive heat may rupture explosively.

Section V — Reactivity Data

Stability: Stable

Conditions to Avoid: Heat sparks, flame and build-up of static electricity. Prevent vapor accumulation

Incompatibility (*Materials to Avoid*): Strong Oxidizers

Hazardous Decomposition or Byproducts: Carbon Monoxide

Hazardous Polymerization: Will Not Occur

Section VI — Health Hazard Data

Route(s)-of Entry: Skin - Frostbite (Primary) Lungs - Inhalation (Primary) Ingestion - N/A

Health Hazards (*Acute and Chronic*): Classified as a simple asphyxiant, minimal oxygen content should be 19.5% by volume under normal atmospheric conditions (ACGIH). Central nervous system depressant. May cause anemia and irregular heart rhythm.

Carcinogenicity: Non-carcinogenic NTP: N/A IARC Monographs: N/A OSHA Regulated: N/A

Signs and Symptoms of Exposure: High concentration can lead to symptoms ranging from dizziness to anesthesia and respiratory arrest if inhaled. Eyes can be moderately irritated.

Medical Conditions Generally Aggravated by Exposure: Caution is recommended for personnel with pre-existing central nervous system or chronic respiratory diseases.

Emergency and First Aid Procedures: Remove to fresh air. If not breathing, administer air, oxygen or CPR. Skin - keep affected area warm and submerge in lukewarm water. Flush eyes immediately with water.

Section VII — Precautions for Safe Handling and Use

Training: In the interest of safety, all persons employed in handling propane gas must be trained in proper handling and operating procedures. This training should also be documented.

Steps to Be Taken in Case Material is Released or Spilled: Keep public away. Shut off gas supply. Eliminate sources of ignition. Ventilate area. Disperse with water spray. Contact between skin and liquid propane can cause freezing of tissue.

Waste Disposal Method: Controlled burning in compliance with applicable codes and laws. Contact supplier.

Precautions to Be Taken in Handling and Storing: Keep containers away from heat sources and store containers in upright position. Containers should not be dropped. Container temperature should not exceed 130°F (54.4°C).

Other Precautions: Close container service valve when not in use and when empty. Install protective cap when not connected for use. Containers, even those that have been emptied, can contain explosive vapors. Do not cut, drill, grind, weld or perform similar operations on or near containers.

DOT Cylinders: DOT specification cylinders must be periodically requalified or they must be removed from service. Store and use cylinders with relief valve in the containers' vapor space.

Section VIII — Control Measures

Respiratory Protection: Use NIOSH or MSHA approved equipment when airborne exposure limits are exceeded.

Ventilation: Provide adequate ventilation where this product is used to meet TLV requirements and to keep concentration in air below 25% of the L.E.L. Mechanical ventilators must meet N.E.C. requirements for being explosion proof.

Protective Gloves: Impervious plastic or neoprene-coated canvas.

Eye Protection: Face shield or chemical goggles when changing valves, hoses, fittings or performing maintenance/service operations in liquid propane service.

Other Protective Clothing or Equipment: N/A

Work/Hygienic Practices: Avoid breathing gas, secure and evacuate area if gas is smelled.

Section IX — Environmental/Regulatory Information

The following information may be useful in complying with various state and federal laws and regulations under various environmental statutes:

Reportable Quantity (RQ), EPA Regulation 40 CFR 302 (CERCLA Section 102): No RQ for product or any constituent greater than 1% or 0.1% (carcinogen).

Threshold Planning Quantity (TPQ), EPA Regulation 40 CFR 355 (SARA Sections 301-304): No TPQ for product or any constituent greater than 1% or 0.1% (carcinogen).

Toxic Chemical Release Reporting, EPA Regulation 40 CFR 372 (SARA Section 313): No toxic chemical is present greater than 1% or 0.1% (carcinogen).

Hazardous Chemical Reporting, EPA Regulation 40 CFR 370 (SARA Sections 311-312)

EPA Hazard Classification Code:	Acute Hazard XXX	Chronic Hazard XXX	Fire Hazard XXX	Pressure Hazard XXX	Reactive Hazard XXX	Not Applicable
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OSHA Hazard Determination: This material is hazardous as defined by OSHA's Hazard Communication Standard, 29CFR 1910.1200

RCRA: This product is not subject to the 40 CFR Part 268.30 land ban on the disposal of certain hazardous wastes.

This product does not contain CFC's, HFC's, or other ozone depleting compounds as defined by the EPA.

Section X — Supplemental Information

Ethyl mercaptan is the preferred warning agent for propane. This is because, in addition to meeting NFPA #58 guidelines for odorization of LP-gases, its liquid/gas equilibrium properties more closely match that of propane, and it has a higher odor intensity at lower concentrations when compared to other odorizing agents. Ethyl mercaptan was first chosen as a viable warning agent in a study by the U.S. Bureau of Mines in 1931, and later confirmed in independent studies by the U.S. Energy Research and Development Administration (ERDA) in 1977.

Although ethyl mercaptan has excellent warning properties, NFPA #58 A-1-4.1 states "It is recognized that no odorant will be completely effective as a warning agent in every circumstance." Studies conducted by Gas Research Institute (GRI), Institute of Gas Technology (IGT), Bartlesville Energy Technology Center, Natural Gas Odorizing, Inc., and others highlight instances where odorants may not be as effective. For example, it has been reported that odor fading caused by chemical oxidation*, absorption, and adsorption can occur in vessels and distribution systems carrying odorized propane. In an underground leak, the odorant may be adsorbed or absorbed by certain soils as the gas passes through the soil to the surface. In a basement, the odorant may be adsorbed or absorbed by masonry surfaces. Extreme cold weather may also reduce the effectiveness of the odorant. It has also been reported that being exposed to an odor for a period of time may affect a person's ability to detect that odor. Other odors in an area, such as a musty basement, may mask or cover up the LP-gas odor. Be advised that even a faint smell of odorant could indicate a dangerous situation.

* **CHEMICAL OXIDATION:** Contact with air (oxygen), rust, or other oxidation agents over a period of time can result in odorant fading. Chemical oxidation is most likely to occur in newly installed tanks and in rusty, wet, or improperly prepared tanks. For this reason it is extremely important for propane tanks to be properly purged, especially when the tank is new or has been allowed to run empty, thus allowing potential air or water contamination.

Disclaimer of Liability

The information in this MSDS was obtained from sources which we believe are reliable. **HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESS OR IMPLIED, REGARDING ITS CORRECTNESS.**

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. **FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE HANDLING, STORAGE, USE, OR DISPOSAL OF THE PRODUCT.**

Ferrellgas

Material Safety Data Sheet

May be used to comply with
 OSHA'S Hazard Communication Standard,
 29 CFR 1910.1200. Standard must be
 consulted for specific requirements

U.S. Department of Labor

Occupational Safety and Health Administration
 (Non-Mandatory Form)
 Form Approved
 OMB No. 1218-0072

IDENTITY (As Used on Label and List)

Crystalline Silica - Stone Products - 2340 - 4560

Note: Blank spaces are not permitted. If any item is not applicable, or no
 information is available, the space must be marked to indicate that

Section I

Manufacturers Name

Waupaca Materials - Faulks Bros. Construction, Inc.

Emergency Telephone No.

715-258-8566

Address (Number, Street, City, State and ZIP Code)

E3481 Hwy. 22 + 54

Telephone No. for Information

715-258-8566

Waupaca, WI

Date Prepared

10-Nov-99

54981

Signature of Preparer (optional)

Section II Hazardous Ingredients / Identity Information

Hazardous Components (Specific Chemical Identity: Common Name(s))

OSHA PEL

ACGIH TLV

Other Limits

Recommended

% (optional)

Hazardous Components - Specific Chemical Identity: Common Name: Free Silica - SiO₂

OSHA PEL: Exposure to airborne crystalline silica shall not exceed an 8 hour time - weighted average limit as stated

in 29 CFRS 1910.1000 Table Z-3 for mineral dusts, specifically "Silica: Crystalline : Quartz (respirable)."

Mppcf

Mg/M³

Crystalline Quartz (respirable)

250

10mg

% SiO₂ + 5% Si₂ + 2

Quartz (Total Dust)

30 mg/M³% SiO₂ + 2ACGIH TLV: Crystalline Quartz, TLV-TWA = 0.1 mg/M³ (respirable dust).

NIOSH has recommended that the permissible exposure limit be 50 micrograms resp. silica per cubic meter of air

(50 mg/M³) averaged over work shift up to 10 hours.

Section III Physical / Chemical Characteristics

Boiling Point

4046 deg. F

Specific Gravity (H₂O) = 1

2.65

Vapor Pressure (mm Hg.)

N / A

Melting Point

2930

Vapor Density (Air = 1)

N / A

Evaporation Rate
(Butyl Acetate = 1)

N / A

Solubility in Water

Insoluble

Appearance and Odor

Granular or Powder -- odorless

Section IV Fire and Explosion Hazard Data

Flash Point (Method Used)

N / A

Flammable Limits

N / A

LEL

N / A

UEL

N / A

Extinguishing Media

N / A

Special Fire Fighting Procedure

N / A

Unusual Fire and Explosion Hazards

N / A

Stability	Unstable		Conditions to Avoid						
	Stable	X							
Incompatibility (Materials to Avoid)									
None									
Hazardous Decomposition or Byproducts									
None									
Hazardous Polymerization	May Occur		Conditions to Avoid						
	Will Not Occur	X	None						
Section VI Health Hazard Data									
Route(s) of Entry:									
<table border="0"> <tr> <td>Inhalation?</td> <td>Skin?</td> <td>Ingestion?</td> </tr> <tr> <td>Yes</td> <td>Eyes, Yes</td> <td>Yes</td> </tr> </table>				Inhalation?	Skin?	Ingestion?	Yes	Eyes, Yes	Yes
Inhalation?	Skin?	Ingestion?							
Yes	Eyes, Yes	Yes							
Health Hazards (Acute and Chronic)									
Pneumoconiosis, mucous membrane irritant caused by exposure to dust by-products									
Carcinogenicity:									
<table border="0"> <tr> <td>NTP?</td> <td>IARC Monographs?</td> <td>OSHA Regulated?</td> </tr> <tr> <td>No</td> <td>No</td> <td>No</td> </tr> </table>				NTP?	IARC Monographs?	OSHA Regulated?	No	No	No
NTP?	IARC Monographs?	OSHA Regulated?							
No	No	No							
Signs and Symptoms of Exposure									
None									
Medical Conditions									
Generally Aggravated by Exposure Respiratory illness									
Emergency and First Aid Procedure									
Eyes: Flush with water for 15 minutes. Inhalation: Move the person to fresh air. Indigestion: Drink large									
amounts of water. Skin: Flush with water, wash with mild soap and water.									
Section VII Precautions for Safe Handling and Use									
Steps to Be Taken In Case Material is Released or Spilled									
Follow established procedures for handling unregulated dusts and sands. Scoop or shovel onto container. Wetting									
with water will reduce airborne dust. Waste Disposal Method. (1) May be handled as unregulated waste. Dispose of									
using normal trash container. (2) Bury in approved landfill.									
Waste Disposal Method									
May be used as fill material similar to sand. EP Toxicity not detected and/or exceeded for Cr,Ag, As, Hg, Cd, Se, Pb, Ba.									
EP Toxicity not detected and/or exceeded for Cr,Ag, As, Hg, Cd, Se, Pb, Ba.									
Precautions to be Taken in Handling and Storing									
Minimize inhalation and direct skin contact. Reserator required in enclosed or poorly ventilated spaces and all other									
work involving high ash exposure.									
Other Precautions									
Carefully follow all disposal regulations (EPA and state)									
Section VIII Control Measures									
Respiratory Protection (Specify Type)									
NIOSH approved disposal dusk mask for comfort. Supplied IAIR / SCBA for high exposure / confined spaces.									
Ventilation	Local Exhaust	Special							
	To maintain exposure below TLV / PEL	None							
	Mechanical (General)	Other							
	To maintain exposure below TLV / PEL	None							
Protective Gloves		Eye Protection							
Use gloves to prevent skin puncture.		Safety glasses or chemical goggles.							
Other Protective Clothing or Equipment									
Safety goggles and normal work clothing for limited exposure. Chemical goggles, dustmask, and full body coverage									
or 2 -peice suit with boots optional.									

THE DATA IN THIS MATERIAL SAFETY DATA SHEET RELATES ONLY TO THE SPECIFIC MATERIAL DESIGNATED HEREIN AND DOES NOT RELATE TO USE IN COMBINATION WITH ANY OTHER MATERIAL OR IN ANY PROCESS. THE INFORMATION SET FORTH HEREIN IS BASED ON TECHNICAL DATA THAT THIS CORPORATION BELIEVES RELIABLE. IT IS INTENDED FOR USE BY PERSONS HAVING TECHNICAL SKILL AND AT THEIR OWN DISCRETION AND RISK. SINCE CONDITIONS OF USE ARE OUTSIDE OUR CONTROL, WE MAKE NO WARRANTIES, EXPRESSED OR IMPLIED, AND ASSUME NO LIABILITY IN CONNECTION WITH ANY USE OF THIS INFORMATION. NOTHING HEREIN IS TO BE TAKEN AS A LICENSE TO OPERATE UNDER OR A RECOMMENDATION TO INFRINGE ANY PATENTS. ANY USE OF THESE DATA AND INFORMATION MUST BE DETERMINED BY THE USER TO BE IN ACCORDENCE WITH FEDERAL, STATE AND LOCAL LAWS AND REGULATORS.



ASTRO PRODUCT CODE # 15029

PRODUCT SAFETY DATA SHEET

SODA ASH

A. GENERAL INFORMATION

TRADE NAME (COMMON NAME) Soda Ash		<input checked="" type="checkbox"/> C.A.S. NO. <input type="checkbox"/> GENERAL PRODUCT CODE # 497-19-8	
CHEMICAL NAME AND/OR SYNONYM Sodium Carbonate			
FORMULA Na_2CO_3		MOLECULAR WEIGHT 105.99	
ADDRESS (No., STREET, CITY, STATE AND ZIP CODE) GENERAL CHEMICAL CORPORATION 90 East Halsey Road Parsippany, N.J. 07054			
CONTACT Manager of Product Safety	PHONE NUMBER (201) 515-1840	LAST ISSUE DATE March, 1993	CURRENT ISSUE DATE August, 1996

B. FIRST AID MEASURES

EMERGENCY PHONE NUMBER (800) 631-8050
<p>SKIN: Wash with plenty of water.</p> <p>EYES: Flush with plenty of water for at least 15 minutes and get medical attention.</p> <p>INGESTION: Drink large quantities of water to dilute the material. Do not induce vomiting.</p> <p>INHALATION: Remove to fresh air.</p> <p>Get medical attention for irritation, ingestion or discomfort from inhalation.</p>

C. HAZARDS INFORMATION

HEALTH

INHALATION Inhalation of product dust may irritate nose, throat and lungs.	
INGESTION Although low in toxicity, ingestion can be harmful - consult a physician. May irritate mouth, esophagus, stomach, etc. LD ₅₀ (rat): 2.8 gm/kg. See reference (a).	
SKIN May cause skin irritation from prolonged contact.	
EYES May irritate or burn eyes.	
PERMISSIBLE CONCENTRATION: AIR (SEE SECTION J) None established. No TLV established.	BIOLOGICAL None.
UNUSUAL CHRONIC TOXICITY None known.	

ASTRO PRODUCT CODE # 15029

C. HAZARDS (Cont.)

FIRE AND EXPLOSION

FLASH POINT Not flammable <input type="checkbox"/> OPEN CUP <input type="checkbox"/> CLOSED CUP	AUTO IGNITION TEMPERATURE NA	FLAMMABLE LIMITS IN AIR (% BY VOL.) LOWER - NA UPPER - NA
UNUSUAL FIRE AND EXPLOSION HAZARDS None.		

D. PRECAUTIONS/PROCEDURES

FIRE EXTINGUISHING AGENTS RECOMMENDED NA
FIRE EXTINGUISHING AGENTS TO AVOID NA
SPECIAL FIRE FIGHTING PRECAUTIONS NA
VENTILATION Local exhaust if dusty condition prevails.
NORMAL HANDLING Avoid eye contact or prolonged skin contact. Avoid breathing dust. When dissolving, add to water cautiously and with stirring; solutions can get hot.
STORAGE Store in a cool, dry area away from acids. Prolonged storage may cause product to cake from atmospheric moisture.
SPILL OR LEAK (ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT - SECTION E) Shovel up dry chemical into an empty container with a cover. Flush residue with plenty of water. (See Section I for disposal methods).
SPECIAL PRECAUTIONS/PROCEDURES/LABEL INSTRUCTIONS Avoid simultaneous exposure to soda ash and lime dust. In the presence of moisture the two materials combine to form caustic soda (NaOH), which may cause burns.
SIGNAL WORD - WARNING

E. PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION Where required, use a respirator approved by NIOSH for product dusts.
EYES AND FACE Wear hard hat (or other head covering) and chemical safety goggles. Do not wear contact lenses.
HANDS, ARMS, AND BODY Wear long-sleeve shirt and trousers, and gloves for routine product use. Cotton gloves are sufficient for dry product; wear impervious gloves when handling solutions.
OTHER CLOTHING AND EQUIPMENT Eyewash is recommended.

ASTRO PRODUCT CODE # 15029

F. PHYSICAL DATA

MATERIAL IS (AT NORMAL CONDITIONS): <input type="checkbox"/> LIQUID <input checked="" type="checkbox"/> SOLID <input type="checkbox"/> GAS <input type="checkbox"/> _____		APPEARANCE AND ODOR White powder. Odorless.	
BOILING POINT ° C MELTING POINT 854 ° C	SPECIFIC GRAVITY (H ₂ O = 1) 2.533	VAPOR DENSITY (AIR = 1) NA	
SOLUBILITY IN WATER (% by Weight) 17% solution at 20 °C	pH 1% solution; pH = 11.3	VAPOR PRESSURE (mm Hg at 20 °C) <input type="checkbox"/> (PSIG) <input type="checkbox"/> NA	
EVAPORATION RATE (Butyl Acetate = 1) <input type="checkbox"/> (Ether = 1) <input type="checkbox"/> NA	% VOLATILES BY VOLUME (At 20 °C) NA		

G. REACTIVITY DATA

STABILITY <input type="checkbox"/> UNSTABLE <input checked="" type="checkbox"/> STABLE	CONDITIONS TO AVOID None.
INCOMPATIBILITY (MATERIALS TO AVOID) Contact with acids will release carbon dioxide gas. When mixed with lime dust and water, corrosive caustic soda may be produced.	
HAZARDOUS DECOMPOSITION PRODUCTS See above	
HAZARDOUS POLYMERIZATION <input type="checkbox"/> MAY OCCUR <input checked="" type="checkbox"/> WILL NOT OCCUR	CONDITIONS TO AVOID None.

H. HAZARDOUS INGREDIENTS (Mixtures Only)

MATERIAL OR COMPONENT / C.A.S. #	WT. %	HAZARD DATA (SEE SECT. J)
NA		

I. ENVIRONMENTAL

DEGRADABILITY/AQUATIC TOXICITY		OCTANOL/WATER PARTITION COEFFICIENT	
ND		ND	
EPA HAZARDOUS SUBSTANCES (CLEAN WATER ACT SEC. 311)		IF SO REPORTABLE QUANTITY: _____	40 CFR 116-117
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
WASTE DISPOSAL METHODS (DISPOSER MUST COMPLY WITH FEDERAL, STATE AND LOCAL DISPOSAL OR DISCHARGE LAWS)			
If permitted by applicable disposal regulations, bury in a solid waste landfill or dissolve and neutralize as follows: Dissolve in water using caution as solution can get hot. Neutralize with acid and flush to sewer with plenty of water. Good ventilation is required during neutralization due to release of CO ₂ gas. Neutralized waste may have to be disposed of by an approved contractor.			
RCRA STATUS OF UNUSED MATERIAL IF DISCARDED		HAZARDOUS WASTE NUMBER: (IF APPLICABLE)	40 CFR 261
Not a hazardous waste.			

J. REFERENCES

PERMISSIBLE CONCENTRATION REFERENCES		
None.		
REGULATORY STANDARDS	D.O.T. CLASSIFICATION:	49 CFR 173
None additional cited.	Not regulated	
GENERAL		
(a) General Chemical Corporation data, unpublished.		

K. ADDITIONAL INFORMATION

This product is not for use as a food or drug additive.

P803 FILE NO. - GC 1000

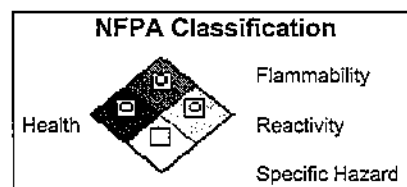
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MATERIAL SAFETY DATA SHEET

SODIUM CHLORIDE



SECTION I - MATERIAL IDENTIFICATION AND USE	
Supplier: NSC MINERALS INC. 2241 Speers Avenue Saskatoon, Saskatchewan Canada S7L 5X6	Emergency Telephone Numbers: (306) 934-6477 (800) 668-7258
Chemical Name: NaCl Sodium Chloride, Salt	Chemical Family: Inorganic Salts
Product Use: Deicing, Animal Feed, Dust Control, Hide Curing, Mud Drilling, Road Base Stabilization	Trade Name: NaCl Sodium Chloride, Salt

SECTION II - HAZARDOUS INGREDIENTS	
Sodium Chloride	CAS # 7647-14-5

SECTION III - PHYSICAL DATA		
Physical State Solid	Odour and Appearance White/Pink Crystals, Odourless	Odour Threshold Not Available
Boiling Point 1465°C	Solubility In Water 35.7g/100g at 0°C	Specific Gravity 2.165 (135lb / ft³)

SECTION IV - FIRE AND EXPLOSION HAZARDS	
Flammability Non Flammable	Means of Extinction Non Combustible

SECTION V - REACTIVITY DATA**Chemical Stability**
Stable**Incompatible Materials**
N/A**SECTION VI - TOXICOLOGICAL PROPERTIES****Route of Entry -** Eye, skin contact, inhalation, ingestion**Effects of Acute Exposure:****Eye** - May cause irritation**Skin** - May cause irritation**Inhalation (of dust)** - May cause respiratory tract irritation**Ingestion** - May cause upset stomach**Irritancy**
May Cause Irritation**Respiratory Tract Sensitization**
No Data Available**Mutagenicity**
No Data Available**Teratogenicity**
No Data Available**Carcinogenicity**
Non-Hazardous By WHIMIS Criteria**Reproductive Effects**
No Data Available**SECTION VII - PREVENTIVE MEASURES****Personal Protective Equipment:****Gloves -** Not required but recommended**Footwear -** Normal**Respiratory -** Not normally required if good ventilation is maintained**Clothing -** Normal**Eyes -** Safety glasses recommended**Leak and Spill Procedures** Use broom or dry vacuum to collect material for reuse or proper disposal. Rinse area with water. Prevent large spills from entering sewers and waterways.**Waste Disposal** Dispose of in accordance with all applicable Federal, Provincial, State and local Environment Regulations.**Storage Requirements**

SECTION VIII - FIRST AID MEASURES

Skin	Wash with soap and water.
Eyes	Flush with large amounts of water.
Inhalation	If symptoms develop, move victim to fresh air. If symptoms persist, obtain medical attention.
Ingestion	Drink large quantities of water. Induce vomiting. Bring to the attention of a physician.

SECTION IX - PREPARATION OF MATERIAL SAFETY DATA SHEET

Prepared By: NSC MINERALS INC.	Date Prepared: July 1, 2002
Phone Number of Preparer: (306) 934-6477	

DISCLAIMER

The data contained herein is believed to be accurate and reliable, but no expressed or implied warranty is made with regard to the accuracy of such data or its suitability for a given situation. Such data relates only to the specific product described and not to such product in combination with any other product. We disclaim all liability for any actions taken or forgone on reliance upon such data. Users should make their own investigation to determine the suitability of the information for their particular purposes.

PRODUCT NAME:
Sodium Cyanide

DS #: DU1252CR

01 CHEMICAL PRODUCT/COMPANY IDENTIFICATION
Material Identification

"CYANOBRİK", "CYANOGRAN" are registered trademarks of DuPont.

Corporate MSDS Number : DU000290
CAS Number : 143-33-9
Formula : NaCN
CAS Name : SODIUM CYANIDE
Grade : "CYANOBRİK"; "CYANOGRAN"

Tradenames and Synonyms

CYANIDE OF SODIUM
PRUSSIAE OF SODA

Company Identification

MANUFACTURER/DISTRIBUTOR

DuPont
1007 Market Street
Wilmington, DE 19898

DuPont Cyanide HOTLINE
(For Transportation Emergencies ONLY)
1-901-357-1546

PHONE NUMBERS

Product Information : 1-800-441-7515
Transport Emergency : CHEMTREC: 1-800-424-9300
Medical Emergency : 1-800-441-3637

02 COMPOSITION/INFORMATION ON INGREDIENTS
Components

Material	CAS Number	#
SODIUM CYANIDE	143-33-9	>96
OTHER SODIUM SALTS		<4

CONTACT WITH WATER LIBERATES:
HYDROGEN CYANIDE GAS

74-90-8

Disclosure as a toxic chemical is required under Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372.

Components (Remarks)

Sodium Cyanide in contact with water liberates small amounts of Hydrogen Cyanide (HCN) gas.

HAZARDS IDENTIFICATION
Potential Health Effects

May be fatal if inhaled, swallowed, or absorbed through skin. Contact with acids, water or weak alkalis liberates poisonous hydrogen cyanide gas. Causes eye burns. May irritate skin and cause alkali burns.

HUMAN HEALTH EFFECTS:

Overexposure by skin contact may include alkali burns, skin irritation with discomfort, and rash. Eye contact may include irritation or burns with discomfort, tearing or blurring of vision. Excessive and prolonged contact may result in permanent eye damage.

Effects of skin contact, inhalation or ingestion overexposures to cyanide are characterized by central nervous system excitation followed by depression. Symptoms may include:

Reddening of the eyes	Nausea
Irritation of the throat	Headache
Palpitation	Weakness of arms and legs
Difficulty in breathing	Giddiness
Salivation	Collapse
Numbness	Convulsions

Convulsions, coma and death due to respiratory arrest may occur without first aid or medical treatment.

Cyanosis (bluish discoloration of the skin) is a sign that follows cardiovascular collapse and apnea (absence of breathing). Reported chronic effects of acute, severe overexposures may not be due to cyanide per se but to the hypoxic (oxygen deficient) state. There appears to be no cumulative effects from repeated exposures. Reports of chronic thyroid effects from occupational exposure to cyanide fail to establish a well defined cause-effect relationship, but may be related to vitamin deficiency.

Individuals with preexisting diseases of the central nervous system may have increased susceptibility to the toxicity of excessive exposures.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

04 FIRST AID MEASURES**# Compound-Specific First Aid & Notes to Physicians**

A step-wise procedure of "First Aid" and "Medical Treatment" is recommended for any cyanide poisoning. Treatment requires immediate action to prevent harm or death. First Aid is given initially, and experience shows that when given promptly it is usually the only treatment needed for typical accidental poisonings. Medical treatment may be needed for more severe poisoning.

First aid treatment uses oxygen and amyl nitrite and can be given by a first responder before medical help arrives.

Medical treatment is given if the patient does not respond to First Aid. Medical Treatment is a more aggressive treatment requiring intravenous injections of sodium nitrite and sodium thiosulfate, and must be administered by qualified medical personnel. It provides a larger quantity of antidote which also helps eliminate cyanide from the body. Even if a doctor or nurse is present, the need for fast treatment dictates using the First Aid procedure with oxygen and amyl nitrite while Medical Treatment

materials for intravenous injection are being prepared. When antidotal treatment is necessary, it should be started immediately.

IN CASE OF CYANIDE POISONING, START FIRST AID TREATMENT IMMEDIATELY, THEN CALL A PHYSICIAN.

In most cases, cyanide poisoning causes a deceptively healthy pink to red skin color. However, if a physical injury or lack of oxygen is involved, the skin color may be bluish. Reddening of the eyes and pupil dilation are also symptoms of cyanide poisoning. Cyanosis (blue discoloration of the skin) tends to be associated with severe cyanide poisonings whereas red coloration of the skin is more common in industrial accidents that involve less cyanide.

All persons with the potential for cyanide poisoning should be trained to provide immediate First Aid using oxygen and amyl nitrite. Always have on hand the materials listed below in the FIRST AID and MEDICAL TREATMENT Sections. Actions to be taken in case of cyanide poisoning should be planned and practiced before beginning work with cyanides. Identification of community hospital resources and emergency medical squads in order to equip and train them on handling of cyanide emergencies is essential.

FIRST AID

FIRST AID SUPPLIES

Adequate First Aid supplies for cyanide poisoning should be conveniently placed throughout the cyanide areas and should be immediately accessible at all times, but secured against tampering or theft. Supplies should be routinely inspected (typically daily) by people who would use them in an emergency. The total number of each item listed below should be adequate to handle the largest number of exposure cases reasonably anticipated, taking into account that some supplies may be wasted, destroyed, or inaccessible in the emergency.

1. Oxygen Resuscitators - Any positive pressure resuscitator capable of giving oxygen in conjunction with amyl nitrite can be used.
2. Amyl Nitrite Ampoules (antidote) - One box of one dozen ampoules per station is usually satisfactory. Locate stations throughout the cyanide area.

CAUTION: Amyl nitrite is not stable and must be replaced every 1-2 years, or earlier depending on storage conditions. Store in the original dated box away from heat and freezing temperatures. Do not store amyl nitrite or Medical Treatment Kits (see below) in enclosed areas where temperatures can exceed 50-66 deg C (140-150 deg F) or where freezing may occur. Storage in high temperature climates may require replacement before the expiration date, unless cool storage is provided. Avoid excessive cold storage which will reduce the vapor pressure of amyl nitrite and, hence, its effectiveness. A common DuPont practice is to use the resuscitator as the storage point for the amyl nitrite ampoules.

3. A set of cyanide first aid instructions should be located at each amyl nitrite storage location. Workers should be fully trained since in a real emergency there will be insufficient time to "read the book".

Amyl Nitrite Notes:

1. Amyl nitrite is highly volatile and flammable; do not smoke or

use around a source of ignition.

2. If treating a patient in a windy or drafty area, provide something--a rag, shirt, wall, drum, cupped hand, etc.--to prevent the amyl nitrite vapors from being blown away. Keep the ampoule upwind from the nose. The objective is to get amyl nitrite into the patient's lungs.

3. Rescuers should avoid amyl nitrite inhalation to avoid becoming dizzy and losing competence.

4. Lay the patient down. Since amyl nitrite dilates blood vessels and lowers blood pressure, laying the patient down will help prevent unconsciousness.

5. Do not overuse. Monitor the patient for shock which would indicate excessive use. This has not occurred in practice at DuPont plants, and we are not aware of any serious after effects from treatment with amyl nitrite.

6. Review and adhere to proper storage, inspection and replacement requirements given above.

FIRST AID PROCEDURE

The exposed person should be removed from the contaminated area, contaminated clothing removed and the individual washed off. The rescuer and/or person providing first aid is subject to exposure if the affected person's clothing is wetted with cyanide. For HYDROGEN CYANIDE, rescue of a wetted person should be done wearing self-contained breathing air (SCBA), rubber gloves, and other personal protective equipment as necessary. For SODIUM CYANIDE or POTASSIUM CYANIDE dusts or solutions, SCBA is normally not needed. Contact with HYDROGEN CYANIDE must be avoided by rescuers, but short contact from solid cyanide or solutions is normally not a problem if skin washing is prompt. As soon as possible, even while clothing is being removed or washing is taking place, First Aid should be started.

1. If no symptoms are evident, no treatment is necessary; decontaminate patient.

2. If conscious but symptoms (nausea, difficult breathing, dizziness, etc.) are evident, give oxygen.

3. If consciousness is impaired (non-responsiveness, slurred speech, confusion, drowsiness) or the patient is unconscious but breathing, give oxygen and amyl nitrite by means of a resuscitator.

To give amyl nitrite, break an ampoule in a gauze pad and insert into lip of the resuscitator mask for 15 seconds, then take away for fifteen seconds. Repeat 5-6 times. If necessary, use a fresh ampoule every 3 minutes until the patient regains consciousness (usually 1-4 ampoules). Administer oxygen continuously. Guard against the ampoule entering the patient's mouth.

4. If not breathing, give oxygen and amyl nitrite immediately by means of a positive pressure resuscitator (artificial respiration).

See 3. above, and continue to give oxygen simultaneously to aid recovery. If massive exposure occurred, consider keeping the first one or two ampoules in the lip of the resuscitator mask continuously. Guard against the ampoule entering the patient's mouth.

INHALATION

If consciousness is impaired, oxygen and amyl nitrite should be administered as indicated above. Carry the patient to an uncontaminated atmosphere. Keep the patient warm and calm. Call a physician.

SKIN CONTACT

If consciousness is impaired, oxygen and amyl nitrite should be administered as indicated above. Immediately flush with large quantities of water for up to 5 minutes after contact or suspected contact, and completely remove all contaminated clothing (including shoes or boots). Flushing with water for up to 5 minutes is generally sufficient to effectively remove cyanide from the patient's skin. Call a physician.

EYE CONTACT

Immediately flush the eyes with large quantities of water for up to 5 minutes while holding the eyelids apart. Do not try to neutralize with "acids" or "alkalis". Eye contact will require further evaluation and possibly treatment. Continue rinsing the eye during transport to the hospital. See a physician. Oxygen and amyl nitrite should be used as indicated above.

INGESTION

If consciousness is impaired, oxygen and amyl nitrite should be administered as indicated above. If the patient is conscious, immediately give the patient activated charcoal slurry. Never give anything by mouth to an unconscious person. Call a physician. Continue to give oxygen. DO NOT give Syrup of Ipecac or other emetics since they will induce vomiting which could interfere with resuscitator use.

NOTE: To prepare activated charcoal slurry, mix 50 grams of activated charcoal in 400 mL (about 2 cups) water and mix thoroughly. Give 5 mL/kg, or 350 mL for an average adult.

MEDICAL TREATMENT

EXPERIENCE SHOWS THAT FIRST AID GIVEN PROMPTLY IS USUALLY THE ONLY TREATMENT NEEDED FOR TYPICAL INDUSTRIAL CYANIDE POISONING. LARGER CYANIDE POISONINGS INCREASE THE NEED FOR MEDICAL TREATMENT.

Do not over-react. Although prompt action is essential when poisoning has occurred, a lucid, conscious person who can communicate may not have significant cyanide poisoning and Medical Treatment will rarely be necessary. "Treat what you see" is a good rule of thumb. Mildly symptomatic patients who remain alert may be managed by supportive care only.

The half-life of cyanide in the body is about 20-90 minutes. In diagnosis and monitoring of patients, the critical period for treatment is short. Normally the effects from cyanide poisoning occur in the first few minutes and will indicate the degree of poisoning.

"Preventive" use of cyanide antidote in the absence of impaired consciousness is not normally warranted. Keep the patient calm by assurance over the next 30 minutes, and closely monitor the patient's condition. If skin contact with cyanide has been prolonged and/or extensive cyanide has been ingested, watch the individual closely for at least 30 minutes to assure there are no effects from delayed absorption of cyanide into the blood stream.

Consider assuring intravenous access in cases where significant toxicity is possible. Establishment of IV access with normal saline, Ringer's lactate, or other available IV fluid will facilitate administration of the antidote if necessary.

MEDICAL TREATMENT KITS

Medical Treatment Kits for cyanide poisoning should be conveniently located for easy access. Materials for intravenous injection are intended for use only by a physician or fully qualified medical personnel. The location of kits should be carefully planned as part of the emergency program. Kits should always be taken with patient during transport to medical facilities to ensure availability. Suggested locations for kits include:

- o in or near the cyanide area
- o plant medical station
- o guard house entrance
- o local hospital
- o doctor's office and residence

CAUTION: Avoid storing amyl nitrite or Medical Treatment Kits in areas subject to extreme heat or freezing conditions. Kits and amyl nitrite should be accessible but secured against tampering. They should be inspected regularly and the amyl nitrite ampoules replaced every 1-2 years (See First Aid Supplies Section). Medical Treatment Kits should contain the following:

1. One box containing one dozen (12) amyl nitrite ampoules.
2. Two sterile ampoules of sodium nitrite solution (10 mL of a 3% solution in each).
3. Two sterile ampoules of sodium thiosulfate solution (50 mL of a 25% solution in each).
4. One 10 mL sterile syringe. One 50 mL sterile syringe. Two sterile intravenous needles. One tourniquet.
5. One dozen gauze pads.
6. Latex gloves.
7. A "Biohazard" bag for disposal of bloody/contaminated equipment.
8. A set of cyanide instructions on first aid and medical treatment.

NOTE: Amyl nitrite ampoules and Medical Treatment Kits can be purchased through local pharmacies with a physician's prescription. The pharmacy can order kits by calling Pasadena Research Labs, Inc. at:

- o 800-223-9851 or 714-492-4030

MEDICAL TREATMENT PROCEDURE

1. Sodium nitrite: Adult - 10 mL of 3% solution (300 mg)
Draw solution from the ampoule and inject slowly over 4-5 minutes (2 to 2.5 mL/minute). As soon as practical, monitor blood pressure and continue checking pulse. Slow the rate of injection

if hypotension (low blood pressure) occurs.

2. Sodium thiosulfate: Adult - 50 mL of 25% solution (12.5 grams) Follow sodium nitrite with sodium thiosulfate injected at a rate of 2.5 mL/minute (10-20 minutes).

The total time for injection of these initial doses of both components at the recommended rates is lengthy, approximately 20-25 minutes.

Consider the body weight and condition of the patient when treating a cyanide exposed patient with sodium nitrite. Both amyl nitrite and sodium produce methemoglobin, which reduces the oxygen carrying capacity of the blood. Methemoglobinemia is potentially harmful when methemoglobin levels exceed 20-30% (See Antidotal Effects below).

If symptoms persist or recur after the initial treatment, repeat the antidote at one half the original doses one hour after the original administration. Monitor methemoglobin levels when practical in every patient treated with the intravenous antidote.

AVOID OVER-TREATMENT.

The above sodium nitrite injection is about one-third the lethal dose, so care should be taken to avoid excessive use. Excessive use has not occurred in DuPont's experience. It is not essential that full quantities of antidote be given just because treatment was started. Should injection be stopped for any reason, keep track of the amount administered in case treatment needs to be restarted.

ANTIDOTAL EFFECTS

Nitrites can produce hypotension through peripheral vasodilatation (widening of the blood vessels). Methemoglobin formation, although considered a therapeutic effect, may cause symptoms if levels exceed 20-30%. Recommended intravenous doses of sodium nitrite usually produce methemoglobin levels under 20%. Headache, nausea, vomiting, and syncope (fainting) may follow nitrite administration, and syncope may occur if the patient is not lying down. While it is important to be aware of the effects from nitrite therapy, there have been no long-lasting effects associated with this treatment regimen for cyanide exposure in DuPont's experience and knowledge.

RECOVERY AND DISPOSITION

For most accidental poisonings, patients can be revived in a few minutes using oxygen and amyl nitrite with complete recovery within a few hours.

If necessary, the patient should be monitored for 24-48 hours. Any patient whose symptoms require the use of IV antidote should be considered for admittance to an intensive care unit.

Observe for return of symptoms. Monitor methemoglobin levels, blood pH and oxygenation through arterial blood gas analysis. Calculate anion gap from serum electrolytes. Cyanide poisoning causes lactate accumulation and an anion gap metabolic acidosis.

Delayed neurotoxic effects are not expected consequences of cyanide exposure although these neurotoxic effects may occur if hypoxia (oxygen deficiency) was prolonged or occurred following massive cyanide exposure.

In the presence of smoke inhalation that can occur during fires, withholding amyl nitrite or sodium nitrite administration should be considered because of the potential for high carboxyhemoglobin levels. However, administration of oxygen and possibly thiosulfate should be continued.

05 FIRE FIGHTING MEASURES

Flammable Properties

Will not burn.

Follow appropriate National Fire Protection Association (NFPA) codes.

Cyanide may not be completely destroyed in an ordinary fire involving combustible materials such as paper or wood. While sodium cyanide does not support combustion, it can oxidize in a fire.

Extinguishing Media

Use water on fires near cyanide but minimize the amount of water if containers are opened or burned to avoid cyanide runoff (see "Incompatibility with Other Materials" and "Fire Fighting Instructions"). DO NOT use carbon dioxide (CO2) on wet cyanide where carbonic acid ($H_2O + CO_2$) could release cyanide.

Fire Fighting Instructions

Cyanide dissolves readily in water; therefore, cyanide solution runoff may occur if containers are opened or burned. Runoff should be contained to avoid environmental or safety problems. Contained cyanide solution can be detoxified with hypochlorite. In some cases it may be desirable to let a fire burn out by itself since sodium cyanide will not normally be affected by the fire.

06 ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Spill Clean Up

Shovel and sweep up spilled material into a covered container or plastic bag pending transfer. Cover and keep spillage dry. Flush spill area with a dilute solution of sodium hypochlorite or calcium hypochlorite to destroy the cyanide. Call DuPont for guidance. Comply with Federal, State, and local regulations reporting releases. The EPA Reportable Quantity (RQ) is 10 pounds.

07 HANDLING AND STORAGE

Handling (Personnel)

Emergency planning and training are needed before beginning work with cyanide since prompt treatment is essential in cases of cyanide poisoning. Always have Cyanide Antidote Kits on hand. Do not breathe dust, mist, or cyanide gas. Do not get in eyes. Avoid contact with skin and clothing. Do not carry foodstuffs, beverages, or tobacco where contamination with cyanide is possible. Wash thoroughly after handling. Wash contaminated clothing before reuse.

Storage

Store in properly labeled containers in dry, ventilated, secured areas. Keep containers closed and contents dry. Do not store with acids or acid salts, containers with water or weak alkalis, or oxidizing agents. Do not handle or store food, beverages, or tobacco in cyanide areas. Do not store near combustibles or flammables because subsequent fire fighting with water could lead to cyanide solution runoff. If legal, do not store under sprinkler systems.

08 EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use sufficient ventilation to keep employee exposure below recommended limits.

Personal Protective Equipment

Recommended minimum protection: Chemical splash goggles and rubber gloves (butyl or neoprene preferred).

Have available and use as appropriate: face shield; rubber suits, aprons, and boots; disposable toxic dust and mist respirators; self-contained breathing air supply (in case of emergency); hydrogen cyanide detector; First Aid and Medical Treatment supplies, including oxygen resuscitators.

Exposure Guidelines

Exposure Limits

Sodium Cyanide

PEL (OSHA)	: 5 mg/m ³ , as CN, 8 Hr. TWA, Skin
TLV (ACGIH)	: Ceiling 5 mg/m ³ , as CN, Skin
AEL (DuPont)	: 5 mg/m ³ , 15 minute TWA, as CN, Skin

Other Applicable Exposure Limits

HYDROGEN CYANIDE GAS

PEL (OSHA)	: 10 ppm, 11 mg/m ³ , Skin
TLV (ACGIH)	: Ceiling 4.7 ppm, 5 mg/m ³ , as CN, Skin
AEL (DuPont)	: 5 mg/m ³ , 15 minute TWA, as CN, Skin

AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

09 PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Boiling Point	: 1496 C (2725 F) @ 760 mm Hg
Vapor Pressure	: Negligible
Vapor Density	: Nil
Melting Point	: 564 C (1047 F)
Solubility in Water	: 37 WT% @ 20 C (68 F)
pH	: 11.3-11.7
Form	: Solid, Granular, Briquettes.
Color	: White.
Specific Gravity	: 1.6
Bulk Density (Packed)	: 50-55 lb/cu ft

The pH listed above is typical for 5-25 % solutions with no pH adjustment.

Solid cyanide has no odor, but it can have a slight ammonia and/or hydrogen cyanide odor if damp.

10 STABILITY AND REACTIVITY

Very stable when dry.

Incompatibility with Other Materials

Large amounts of poisonous, flammable hydrogen cyanide (HCN) gas will be evolved from contact with acids. Reacts violently with strong oxidizing agents when heated. Water or weak alkaline solutions can produce dangerous amounts of hydrogen cyanide in confined areas.

Decomposition

Moisture will cause slow decomposition, releasing poisonous hydrogen cyanide and ammonia gases.

Polymerization

Polymerization will not occur.

11 TOXICOLOGICAL INFORMATION

Animal Data

Oral LD50: 15 mg/kg in rats

The compound is a skin and eye irritant in tests with laboratory animals. Toxic effects described in animals from exposure by inhalation, ingestion, or skin contact include asphyxia (lack of oxygen), dyspnea (shortness of breath), ataxia (incoordination), tremors, coma, and lethality by disrupting oxidative metabolism. Tests in bacterial and mammalian cell cultures demonstrate no mutagenic activity. Tests for embryotoxicity in animals have shown an embryotoxic or teratogenic effect only at exposure levels very nearly lethal to the maternal animals. Observance of the established exposure limits and prevention of skin contact with sodium cyanide solutions should be adequate to prevent adverse health effects on anyone in the workplace, including the conceptus (fetus).

12 ECOLOGICAL INFORMATION

Ecotoxicological Information

AQUATIC TOXICITY:

96 hour LC50 - Fathead minnows: 0.43-0.66 mg/L.
Extremely toxic.

13 DISPOSAL CONSIDERATIONS

Waste Disposal

This material may be a RCRA Hazardous waste. Do not flush cyanide into sewers which may contain an acid. Detoxify with dilute sodium hypochlorite, hydrogen peroxide, or calcium hypochlorite. Comply with Federal, State, and local regulations on disposal methods used to achieve the constituent based treatment standard, if permitted; or transfer to a licensed disposal contractor.

TRANSPORTATION INFORMATION

Shipping Information

DOT
Proper Shipping Name : SODIUM CYANIDE
Hazard Class : 6.1
I.D. No. (UN/NA) : UN1689

DOT Label(s) : POISON
 Special Information : MARINE POLLUTANT
 Packing Group : I

DOT/IMO
 Proper Shipping Name : SODIUM CYANIDE, SOLID
 Hazard Class : 6.1
 UN No. : 1689
 DOT/IMO Label : POISON
 Special Information : MARINE POLLUTANT
 Packing Group : I

Reportable Quantity : 10 lb (4.54 kg)

Shipping Containers

Steel Drums : 50 kg, 100 kg

"CYANO-DOL" Railcars and Trucks
 Excel I and Excel II Trucks
 Hopper Railcars
 "FLO-BINS" (3,000 lb. net; 3,600 lb. gross)
 Bag in a Box (1,000 kg./2,200 lb.)

Tuff Paks: 48, 20 kg bags in a box (960 kg or 2112 lbs).

15 REGULATORY INFORMATION U.S. Federal Regulations

TSCA Inventory Status : Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : Yes
 Chronic : No
 Fire : No
 Reactivity : Yes
 Pressure : No

HAZARDOUS CHEMICAL LISTS

SARA Extremely Hazardous Substance: Yes
 CERCLA Hazardous Substance : Yes
 SARA Toxic Chemical : Yes

Canadian Regulations

CLASS D Division 1 Subdivision A - Very Toxic Material/Acute
 Lethality.

CLASS D Division 2 Subdivision B - Toxic Material. Skin or Eye
 Irritant.

16 OTHER INFORMATION NFPA, NPCA-HMIS

NFPA Rating
 Health : 3
 Flammability : 0
 Reactivity : 1

NPCA-HMIS Rating
 Health : 3
 Flammability : 0
 Reactivity : 1

Personal Protection rating to be supplied by user depending on use conditions.

Additional Information

The "Skin" notation in the Exposure Limits Section indicates that liquid or vapor may penetrate the skin (especially if the skin is broken). Control of vapor, dust, and mist inhalation alone may not be sufficient to prevent an excessive dose.

For further information, see DuPont Cyanide Storage and Handling Bulletin.

Responsibility for MSDS : DuPont Chemicals
Address : Engineering & Product Safety
> : P.O. Box 80709, Chestnut Run
> : Wilmington, DE 19880-0709
Telephone : (302) 999-4946

Indicates updated section.

End of MSDS

----- NOTICE -----

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* * * E N D O F M S D S * * *



Continental Lime Inc.

Material Safety Data Sheet

IDENTITY

QUICKLIME (CALCIUM OXIDE)

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name

CONTINENTAL LIME INC.

Emergency Telephone Number

(406) 266-5221

Address (Number, Street, City, State, and ZIP Code)

INDIAN CREEK PLANT

[AFTER HOURS - (406) 266-3465]

4.5 MILES N.W. OF TOWNSEND

Telephone Number for Information

(801) 264-3942

TOWNSEND, MT 59644

Date Prepared

15-Jun-94

Section II - Hazardous Ingredients/Identify Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
CALCIUM OXIDE, QUICKLIME, HOT LIME, LIME	5 mg/m3	2 mg/m3		> 93%

FORMULA: CaO

CAS NO.: 1305-78-8

Section III - Physical/Chemical Characteristics

Boiling Point	5162 F 2850 C	Specific Gravity (H ₂ O = 1)	
Vapor Pressure (mm Hg)	N/A	Melting Point	3.2-3.4 4658 F 2570 C
Vapor Density (AIR = 1)	1.9	Evaporation rate (Butyl Acetate = 1)	N/A

Solubility in Water

NEGLECTIBLE 0.054% - 0.140% (% BY WEIGHT)

Appearance and Odor

WHITE OR GREYISH-WHITE LUMPS OR GRANULAR POWDER, ODORLESS

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used)	N/A	Flammable Limits	N/A	LEL	N/A	UEL	N/A
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Extinguishing Media

NON-COMBUSTIBLE, USE EXTINGUISHING MEDIA APPROPRIATE TO FIRE.

Special Firefighting Procedures

CONTACT WITH MOISTURE OR WATER MAY GENERATE SUFFICIENT HEAT

TO IGNITE COMBUSTIBLE MATERIALS.

Unusual Fire and Explosion Hazards

IN SMALL AMOUNTS ITS PRESENCE IN A FIRE DOES NOT HINDER THE USE OF ANY STANDARD EXTINGUISHING MEDIUM.

670 East 3900 South, Suite 205, Salt Lake City, Utah, 84107, Phone (801) 262-3942, Fax (801) 264-3039

Section V - Reactivity Data

Stability	Unstable	YES	Conditions to Avoid MAY REACT VIOLENTLY WITH STRONG ACIDS AND WATER.
	Stable	YES	WHEN STRONG ACIDS OR WATER ARE NOT PRESENT.

Incompatibility (Materials to Avoid)

WATER, STEAM, ACIDS, OXIDANTS, FLUORINE.

Hazardous Decomposition or Byproducts

N/A

Hazardous Polymerization	May Occur		Conditions to Avoid N/A
	Will Not Occur	X	

Section VI - Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	YES	YES	YES

Health Hazards (Acute and Chronic)

IRRITATION OR SEVERE CHEMICAL BURNS CAN RESULT IF QUICKLINE IS INHALED, SWALLOWED, OR COMES IN CONTACT WITH THE EYES OR SKIN. ADHERE TO CONTROL MEASURES IN SECTION VII.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Registered?
	NO	NO	NO

Signs and Symptoms of Exposure

IRRITATION AND OR CHEMICAL BURNS DUE TO ALKALINITY, DEHYDRATION, AND THERMAL EFFECTS.

A PERSPIRING PERSON IS ESPECIALLY SUSEPTABLE.

Medical Conditions Generally Aggravated by Exposure

MAY IRRITATE RESPIRATORY TRACT DISORDERS. EYES AND "OPEN CUTS" ARE PARTICULARLY VULNERABLE.

Emergency and First Aid Procedure

EYES: FLUSH IMMEDIATELY WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. CALL A PHYSICIAN.

SKIN: WASH SKIN IMMEDIATELY WITH PLENTY OF WATER.

INHALATION: REMOVE TO FRESH AIR. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION.

INGESTION: IF PERSON IS CONSCIOUS GIVE LARGE QUANTITIES OF WATER FOLLOWED BY FRUIT JUICE. CALL A PHYSICIAN.

Section VII - Precautions for Safe Handling and Use**Steps to be Taken in Case Material is Released or Spilled**

KEEP SPILL AREA DRY AND USE DRY COLLECTION TECHNIQUES TO COLLECT AND CONTAIN SPILLED

MATERIAL. AVOID CREATING AIRBORNE DUST; MATERIAL MAY BE RECLAIMED.

Waste Disposal Method

DISPOSE OF IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

Precautions to be Taken in Handling and Storage

STORE IN A COOL, DRY AREA IN TIGHTLY CLOSED CONTAINERS. AVOID ANY TYPE OF MOISTURE.

PROTECT CONTAINERS FROM PHYSICAL DAMAGE. KEEP AWAY FROM INCOMPATIBLES (SEE SECT. V).

Other Precautions

NONE

Section VIII - Control Measures**Respiratory Protection (Specify Type)**

USE NIOSH/MSHA APPROVED RESPIRATORS IF AIRBORNE CONCENTRATION EXCEEDS TLV.

Ventilation	Local Exhaust	Special
	USE TO CAPTURE DUST AT SOURCE.	N/A
	Mechanical (General)	Other
	KEEP DUST BELOW TLV.	VENT DUST TO DUST "COLLECTOR".

Protective Gloves

USE GLOVES TO PREVENT SKIN CONTACT.

Eye Protection

USE TIGHT FITTING SAFETY GOGGLES.

Other Protective Clothing or Equipment

LONG SLEEVED SHIRT WITH BUTTON COLLAR AND LONG PANTS EXTENDING OVER HIGH TOP WORK BOOTS.

Work/Hygiene Practices

USE PROTECTIVE BARRIER CREAM, PARTICULARLY ON WRISTS AND NECK. WASH WELL WITH SOAP

AND WATER AFTER WORKING WITH THIS PRODUCT.

670 East 3900 South, Suite 205, Salt Lake City, Utah, 84107, Phone (801) 262-3942, Fax (801) 264-8039



[Home Page](#)

Prod. No. 19539 Sodium Hydroxide

Chemtrec Emergency Number 800-424-9300 (24 hrs a day)
Ted Pella, Inc., P.O. Box 492477, Redding, CA 96049-2477
Phone (530) 243-2200 (Mon-Fri. 6:00 to 4:00pm P.S.T.)

Material Safety Data Sheet (10-1-91)

Section 1 Product Identification:

Product Name: Sodium Hydroxide
Chemical Name: Sodium Hydroxide, solid
Chemical Family: Inorganic Base (Alkali)
Chemical Formula: NaOH
Molecular Weight: 40.00

Section 2 Hazardous Ingredients:

Component	CAS #	%	Exposure Guidelines	
			OSHA-PEL CL	ACGIH-TLV CL
Sodium Hydroxide	1310-73-2	100	2 mg/m ³	2 mg/m ³

NFPA Hazard Ratings: Health: 3; Flammability: 0; Reactivity: 1
(Scale: 0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe)

Section 3 Physical Data:

Boiling Point, (C 760 mm hg): 1390°C
Melting Point (C): 318.4°C
Specific Gravity (H₂O=1): 2.13
Vapor Density (air=1): NA
Solubility in H₂O: Soluble
Evaporation Rate, (butyl acetate= 1): NA
Vapor Pressure (mm hg): NA
Percent volatile by Vol.: NA
Appearance and Odor: White, odorless, deliquescent pellets, flakes or granules.

Section 3 Fire and Explosion Hazard Data:

Flash Point: Noncombustible

Flammable Limits: Lower: NA, Upper: NA

Extinguishing Methods: Flood with water, using care not to splatter or splash the material.

Special Fire Fighting Procedures: Wear self-contained breathing apparatus and protective clothing.

Unusual Fire and Explosion Hazards: Can react with certain metals (AL, SN, MG, CU, etc.) to release explosive hydrogen gas.

Section 5 Health Hazard Information:

Potential health effects (Acute and Chronic)

Extremely Toxic and Corrosive

Causes Severe Burns on Contact with any Body Tissue.

Vapor Irritating to Eyes and Respiratory Passages

Primary Routes of Entry: Inhalation, ingestion or skin contact.

Medical Conditions Aggravated by Exposure: Data not available.

Toxicity Data: ORL-RBT LDLO: 500 mg/kg

Toxicological Findings: Tests on laboratory animals indicate material may produce adverse mutagenic effects.

Cited in registry of toxic effects of substances (RTECS).

Carcinogenicity: The material is not listed (IARC, NTP, OSHA) as a cancer causing agent.

Section 6 Emergency and First Aid Procedures:

Eye Contact: Immediately flush thoroughly with water for at least 15 minutes.

Skin Contact: Immediately flush thoroughly with large amounts of water. Remove contaminated clothing and wash before reuse.

Inhalation: Remove to fresh air; give artificial respiration if breathing has stopped.

Ingestion: Do not induce vomiting; if conscious, give water freely and get medical attention.

Get medical attention for cases of overexposure.

Section 7 Reactivity Data:

Stability: Stable

Hazardous Polymerization: Will not occur

Incompatibility (Materials to Avoid): Water, acids, chlorinated hydrocarbons, metals, organic materials.

Conditions to avoid: Contact with moisture may generate sufficient heat to ignite surrounding combustible material.

Hazardous Decomposition Products: None indicated.

Section 8 Special Protection Information:

Ventilation: Material should be handled or transferred in an approved fume hood or with adequate ventilation.

Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TVL/PEL), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your safety equipment supplier). Engineering and/or administrative controls should be implemented to reduce exposure.

Protective Gloves: Nitrile or equivalent must be worn to prevent skin contact.

Protective Clothing: Impervious clothing should be worn when handling this material.

Eye Protection: Safety glasses with side shields must be worn at all times.

Other Protective Equipment: Eye wash and safety shower should be readily available.

Personal Hygiene/Work Practices: Wash thoroughly after handling. Do not take internally.

Section 9 Environmental and Disposal Data

Action to Take in for Spills/Leaks: Evacuate the area of all unnecessary personnel. Wear suitable protective equipment listed under Section 8.

Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards. Contain the release and eliminate its source, if this can be done without risk. Take up and containerize for proper disposal as described under disposal.

Comply with local, state and Federal regulations on reporting releases. Refer to regulatory information for reportable quantity and other regulatory data.

Waste Disposal Considerations: Material does not have an EPA waste number and is not a listed waste, however consultation with a permitted waste disposal site (TSD) should be accomplished. Always contact a permitted waste disposer (TSD) to assure compliance with all current local, state and Federal regulations.

Section 10 Special Precautions:

Precautions to Be Taken in Handling and Storing: Keep container tightly closed.

Do not breathe dust or vapor.

Store in a dry, well-ventilated area away from acids, metals, explosives, organic peroxides and easily ignitable materials.

While making solution add slowly to surface of solution to avoid violent splattering.

Do not get in eyes, on skin or on clothing.

Retained residue may make empty containers hazardous; use caution.

Section 11 Regulatory Information:

Sodium Hydroxide - CERCLA -RQ (LBS.): 1000

Sodium Hydroxide - OSHA Floor List: Y

TSCA Inventory: The CAS number of this product is listed on the TSCA Inventory.

Section 12 Transport Information:

DOT Proper Shipping Name: Sodium Hydroxide, Dry Solid

DOT ID Number: UN1823

Revision History:

8-1-84, 5-1-85, 6-18-87, 10-27-87, 1-26-89, 5-19-89, 3-1-91

NA= Not available

Ted Pella, Inc. makes no warranty of any kind regarding the information furnished herein. Users should independently determine the suitability and completeness of information from all sources. While this data is presented in good faith and believed to be accurate, it should be considered only as a supplement to other information gathered by the user. It is the User's responsibility to assure the proper use and disposal of these materials as well as the safety and health of all personnel who may work with or otherwise come in contact with these materials.



CHILEAN NITRATE CORPORATION

Material Safety Data Sheet

SECTION I

IDENTIFICATION

Chemical Name SODIUM NITRATE	Chemical Family NITRATES	Cas No. 7631-99-4
Trade Name NITEROX™	Synonyms None	Percent (Min.) 99.4
Chemical Formula NaNO₃	Description Prills (Pellets)	White Solid Mol. Wt. 85.01

SECTION II

MANUFACTURER INFORMATION

Manufacturer's Name Sociedad Química y Minera de Chile, S.A.	Emergency Telephone Numbers Chemtrec 800-424-9300 Chilean Nitrate 804-640-7270
Address Chilean Nitrate Corporation Town Point Center, 150 Boush St. Suite 701 Norfolk, Virginia 23510	Telephone Number For Information 804-640-7270 Telex 823427 Date Prepared May 4, 1989

SECTION III

INGREDIENTS

Component	OSHA PEL	ACGIH TLV	Other Limits Recommended	Significant Effects
Sodium Nitrate	No Information Available	None Established	No Information Available	None Established

SECTION IV

FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	Flammable Limits	OSHA Classification	Flammable Explosive Limits	
			Upper	Lower
Not Applicable	Not Applicable	Class 1 Oxidizer	Not Applicable	Not Applicable
Extinguishing Media Small Fires: Dry Chemical, CO₂, water spray or foam Large Fires: Water spray, fog or foam				
Special Fire Fighting Procedures Remove containers from fire if possible without risk. Cool containers exposed to flames with water. Use NIOSH/MSHA approved self-contained breathing apparatus where this material is involved in a fire.				
Unusual Fire and Explosion Hazards Oxidizer. Keep away from reducing agents, will explode if heated to 1,000°C in presence of reducing agents, organic materials or mixed with cyanides. Yields toxic gaseous oxides when heated.				

SECTION V

HEALTH HAZARD DATA

Health Hazards Acute Exposure: Irritation of skin and/or mucous membranes. Ingestion of large amounts causes violent gastroenteritis. Chronic exposure: Anemia, methemoglobinemia, nephritis. Routes of exposure include inhalation, skin contact and ingestion.
Symptoms of Overexposure: Dizziness, abdominal cramps, vomiting, headache, mental impairment, cyanosis.
Carcinogenicity: Sodium Nitrate has not been directly implicated as a carcinogen. A constant oral intake of nitrate containing foods or water could lead to formation of carcinogenic N-Nitroso compounds.

EMERGENCY FIRST AID PROCEDURES

SKIN	Flush thoroughly with water
EYES	Flush with water for 15 minutes, call a physician.
INGESTION	Drink water, induce vomiting by sticking finger down throat, call a physician.
INHALATION	Remove victim to fresh air, call a physician.

CHEMICAL NAME: SODIUM NITRATE

SECTION VI

TOXICOLOGY (Product)

Acute Oral LD 50	4.3 G/Kg (RATS)	Carcinogenic: not known to be carcinogenic
Acute Dermal LD 50	Not Determined	Mutagenic: not known to be mutagenic
Acute Inhalation LC 50	Not Determined	Eye irritation: may be an irritant
		Primary skin irritation: may be an irritant
Principal routes of absorption Oral, inhalation, skin		
Effects of acute exposure dizziness, abdominal cramps, vomiting, headache, mental impairment, cyanosis, may cause skin, eye and mucous membrane irritation.		
Effects of chronic exposure None expected at industrial use levels		

SECTION VII

REACTIVITY DATA

Stability (under normal conditions) Stable <input checked="" type="checkbox"/> Unstable <input type="checkbox"/>	Incompatibility (material to avoid) avoid contact with reducing agents and flammable or combustible materials.
Hazardous Polymerization May occur <input type="checkbox"/> Will not occur <input checked="" type="checkbox"/>	Hazardous decomposition: products oxides of nitrogen.

SECTION VIII

PHYSICAL DATA

Boiling Point (°C) Not Applicable	Melting Point (°C) 306.8	Vapor Pressure (MM/Hg) Not Applicable	Appearance White Prills (Pellets)
Solubility in water Soluble	Specific Gravity (H ₂ O = 1) 2.26	Vapor Density (Air = 1) Not applicable	Evaporation rate No information available

SECTION IX

SAFE HANDLING & USE PRECAUTIONS

Waste Disposal Method Sanitary landfill in accordance with federal, state and local regulations.	Other precautions Wood and empty paper bags used to hold this product should be removed from the premises.
Steps to be taken in case material is released or spilled wear impervious gloves, boots, wear goggles, coveralls. Wear NIOSH/MSHA approved dust respirator. Sweep or shovel up spilled material.	Handling and storing precautions store away from Reducing agents and liquids of low flashpoints. Storage area should be cool, dry, well ventilated and fireproof.

SECTION X

CONTROL MEASURES

Respiratory protection NIOSH/MSHA - Approved dust type respirator	Ventilation Mechanical (General)
Protective gloves Impervious - Butyl or rubber	Eye Protection Goggles
Other protective clothing or equipment Coveralls and impervious boots	Work/hygenic practices Follow recommendations in section IX safe handling & use precautions and wash skin and clothing after contact

Material contained herein complies with OSHA's hazard communication standard, 29 CFR 1910. 1200. Standard must be consulted for specific requirements.

The information contained herein is to the best of our knowledge and belief, accurate. However Chilean sodium nitrate is sold without representations or warranties, express or implied, of fitness for use or purpose or of merchantability beyond the description of said material on the face hereof, and is sold on the condition that seller shall not be liable for accident, injury, or damage occasioned during or resulting from the transportation, handling, storage, sale or use of the material.

Information furnished by: M. Hall & H. Conrad, Date: May 4, 1989

Chilean Nitrate Corporation

Town Point Center, 150 Boush Street, Suite 701

Norfolk, Virginia 23510

Chemtrec: 800-424-9300 Emergency Telephone: 804-640-7270

**MATERIAL SAFETY DATA SHEET**

MSDS Date: April 12, 1996
Emergency Contact: 1-800-424-9300

SECTION I

PRODUCT NAME: Sulfur Dioxide
SYNONYMS: Sulfurous (Acid) Anhydride, Sulfurous Oxide, Sulphur Dioxide
FORMULA: SO₂

DOT SHIPPING INFORMATION: Sulfur Dioxide, Liquified, 2.3, UN 1079;
Hazard Zone C; Poison - Inhalation Hazard

SECTION II - HAZARDOUS INGREDIENTS

HAZARDOUS MATERIAL	CAS NUMBER	WT %	EXPOSURE LIMITS IN AIR
Sulfur Dioxide	7446-09-5	-----	PEL/TLV = 2 ppm (TWA)

SECTION III - PHYSICAL DATA

BOILING POINT (F): -10 °C (14 F) @ 760 mm Hg **SPECIFIC GRAVITY (at 0 °C):**
1.436

VAPOR PRESSURE (mm Hg): (at 20 °C) 2475 **% VOLATILE, BY VOLUME:** 100%

VAPOR DENSITY (air = 1): 2.926 g/L (760) **EVAPORATION RATE:** abt 40 g/m²/s
@ 21 °C

SOLUBILITY IN WATER: 11.9 % by wt @ 15 °C

APPEARANCE AND ODOR: Colorless gas or liquid. Strong pungent odor.

MATERIAL SAFETY DATA SHEET
Page 2

PRODUCT NAME: Sulfur Dioxide

SECTION IV - FIRE AND EXPLOSION DATA

FLASH POINT:

Nonflammable

FLAMMABLE LIMITS:

Lel: N/A

Uel: N/A

EXTINGUISHING MEDIA:

Use appropriate media to extinguish source of fire.

SPECIAL FIRE-FIGHTING PROCEDURES:

Remove Sulfur Dioxide containers from fire zone if possible. Apply water to cool containers unless there is a sulfur dioxide leak. In presence of SO₂, use self-contained breathing apparatus and full protective clothing. Gas tight suits required in extreme (> 1000 ppm) concentrations of SO₂ gas.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Cylinders and ton containers will vent through the fusible plug at 71° C (160° F). Tank cars and tank trucks are fitted with safety relief valves and will vent at 1,550 kPa (225 psig) or 944 kPa (137 psig) in a fire or when unduly high pressure is applied; e.g., excessive air padding. Sulfur dioxide is not explosive.

SECTION V - REACTIVITY DATA

STABILITY:

|x| Stable | | Unstable

HAZARDOUS POLYMERIZATION:

|x| Will not occur | | Will occur

CONDITIONS OR MATERIALS TO AVOID:

Avoid exposure to moisture and high temperatures. Moist gas corrodes most metals. Reacts with water. Reacts vigorously with strong alkalies and oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS:

Does not decompose, but will react with water or steam to produce corrosive products.

SECTION VI - HEALTH HAZARD DATA

NFPA HAZARDOUS RATING: Health = 2 Flammability = 0 Reactivity = 0

Carcinogenic Listing: NTP IARC MONOGRAPHS OSHA 29 CFR 1910

PRODUCT NAME: Sulfur Dioxide

SECTION VI - HEALTH HAZARD DATA (Cont'd)

ENTRY ROUTES & EFFECTS OF OVEREXPOSURE:

Contact: Liquid Sulfur Dioxide can cause frost bite and skin burns. SO₂ converts to sulfurous acid in moist environments which may cause skin irritations. Corneal burns, opacification and blindness may result if liquid SO₂ is splashed in the eyes. Sulfur dioxide can penetrate the intact cornea and cause iritis.

Inhalation: Acute exposure may result in dryness and irritation of the nose and throat, choking, sneezing, coughing and broncho-spasm. Severe exposure may cause death through systemic acidosis, pulmonary edema or from respiratory arrest. Prolonged or repeated exposure may cause impaired lung function, bronchitis, hacking cough, nasal irritation and discharge, increased fatigue, alteration in the senses of taste and smell, and longer duration of common colds. Dental caries, loss of fillings, gum disorders and the rapid and painless destruction of teeth may result from overexposure.

Ingestion: Causes severe burns to the mouth, throat and gastrointestinal system.

STATEMENT OF PRACTICAL TREATMENT:

Contact: Flush exposed area thoroughly with water for at least 15 minutes. Start flushing while removing contaminated clothing. If irritation persists, repeat flushing. Obtain medical attention immediately. Treat frostbite by immediately immersing affected area in warm water until the skin has warmed up and turned pink. Obtain medical attention immediately. For eyes, immediately flush with cool water for at least 15 minutes and get immediate medical attention.

Inhalation: Move victim to fresh air. If breathing has stopped, begin artificial respiration. Give CPR if there is no breathing and no pulse. Obtain medical attention immediately.

Ingestion: Since material is a gas at room temperature, ingestion is unlikely to occur. If victim is alert and not convulsing, give several glasses of water or milk. Do not induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head down and give more fluids. Do not give anything by mouth to an unconscious or convulsing person. Obtain medical attention immediately.

NOTE TO PHYSICIAN: No specific antidote is available. All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than

this product may have occurred.

MATERIAL SAFETY DATA SHEET

Page 4

PRODUCT NAME: Sulfur Dioxide

SECTION VII - SPECIAL PRECAUTIONS

HANDLING AND STORAGE PRECAUTIONS:

Only trained personnel using appropriate protective equipment should handle Sulfur dioxide. Avoid breathing gas. Do not get in eyes, on skin or on clothing. Store in a cool, dry area in properly designated pressure vessels. Keep away from heat sources. Segregate from combustible material.

STEPS TO BE TAKEN IF MATERIAL SPILLS OR LEAKS:

Move unprotected personnel upwind. If a SO₂ container is leaking, try to position it so that gas, rather than liquid, leaks. Using full protective equipment, apply emergency sealing device if possible. Cover leak area with tarpaulin or plastic sheet to limit spread of SO₂. Leaking SO₂ cylinder should never be immersed in water. Neutralize with dilute solutions of soda ash, caustic soda, hydrated lime or sodium bicarbonate. Maintain alkaline pH during neutralization. Alkaline solutions must be oxidized before disposal due to their oxygen demands.

WASTE DISPOSAL METHOD:

Alkaline solutions must be oxidized before disposal due to their oxygen demands. Dispose of waste material at an approved waste treatment /disposal facility, in accordance with local, state and federal regulations. Do not dispose of waste with normal garbage or to sewer systems.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:

NIOSH/MSHA approved air-purifying respirator equipped with acid gas cartridges for concentrations up to 20 ppm. Air-supplied respirator for higher or unknown concentrations.

VENTILATION:

Local exhaust ventilation preferred. SO₂ should be collected and neutralized in a suitable scrubbing system.

EYE PROTECTION:

Tight fitting chemical goggles and face shield.

SKIN PROTECTION:

Heavy-weight coveralls, safety boots and insulated impervious gloves.

OTHER PROTECTIVE EQUIPMENT:

Impervious gas-tight overall body protection depending on exposure. Safety showers and eyewash stations should be readily available in an area not likely to be affected by a release of Sulfur dioxide, and near storage and handling areas. Insulated gloves should be worn if liquid contact is anticipated.

MATERIAL SAFETY DATA SHEET

Page 5

PRODUCT NAME: Sulfur Dioxide

ACGIH	= American Conference of Governmental Industrial Hygienists
CL	= Ceiling Level
IARC	= International Agency for Research on Cancer: Monographs
OSHA	= Occupational Safety and Health Administration
N/A	= Not Applicable
NTP	= National Toxicology Program: Annual Report on Carcinogens
PEL	= Permissible Exposure Level (OSHA)
TLV	= Threshold Limit Value (ACGIH)
TWA	= Time Weighted Average over 8 Hours
STEL	= Short Term Exposure Limit (ACGIH)
ND	= Not Determined

This information is, to the best of our knowledge, accurate but may not be complete. THATCHER COMPANY furnishes this information in good faith, but without warranty, representation or guarantee of its accuracy, completeness, or reliability.



Date Issued: 1998-01-06
Supersedes: 1997-07-15
845/20

TEXACO
MATERIAL SAFETY DATA SHEET

NOTE: Read and understand Material Safety Data Sheet before handling or disposing of product.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATERIAL IDENTITY

Product Code and Name:

01854 ATF MERCON/DEXRON III

Chemical Name and/or Family or Description:

Transmission Fluid

Manufacturer's Name and Address:

TEXACO LUBRICANTS COMPANY

P.O. Box 4427

Houston, TX 77210-4427

Telephone Numbers:

Transportation Emergency-Company : (914) 831-3400

CHEMTREC (USA): (800) 424-9300

In Canada : (800) 567-7455

Health Emergency -Company : (914) 831-3400

General MSDS Assistance : (914) 838-7204

Texaco FaxBack System : (713) 432-3383

Technical Information -Fuels : (914) 838-7336

-Lubricant/: (800) 782-7852 (Option 4)

Antifreezes/Fuel Additives

-Solvents/Chemicals : (800) 876-3738

2. COMPOSITION/INFORMATION ON INGREDIENTS

THE CRITERIA FOR LISTING COMPONENTS IN THE COMPOSITION SECTION IS AS FOLLOWS: CARCINOGENS ARE LISTED WHEN PRESENT AT 0.1 % OR GREATER; COMPONENTS WHICH ARE OTHERWISE HAZARDOUS ACCORDING TO OSHA ARE LISTED WHEN PRESENT AT 1.0 % OR GREATER; NON-HAZARDOUS COMPONENTS ARE LISTED AT 3.0 % OR GREATER. THIS IS NOT INTENDED TO BE A COMPLETE COMPOSITIONAL DISCLOSURE. REFER TO SECTION 14 FOR APPLICABLE STATES' RIGHT TO KNOW AND OTHER REGULATORY INFORMATION.

Product and/or Component(s) Carcinogenic According to:

OSHA IARC NTP OTHER NONE

- - - - X

Composition: (Sequence Number and Chemical Name)

Seq.	Chemical Name	CAS Number	Range in %
01 #	Solvent-dewaxed heavy paraffinic petroleum distillates	64742-65-0	35.00-49.99
02 #	Hydrotreated light paraffinic petroleum distillate	64742-55-8	35.00-49.99
03 #	Hydrotreated light naphthenic petroleum distillates	64742-53-6	1.00-2.99
04 *	Polymethacrylate	50867-55-5	1.00-2.99
05 *	Boronated substituted succinimide		1.00-2.99

PRODUCT IS NON-HAZARDOUS ACCORDING TO OSHA (1910.1200).

* COMPONENT IS HAZARDOUS ACCORDING TO OSHA.

COMPONENT, BY DEFINITION, IS CONSIDERED HAZARDOUS ACCORDING TO OSHA BECAUSE IT CARRIES THE PERMISSIBLE EXPOSURE LIMIT (PEL) FOR MINERAL OIL MIST.

Exposure Limits referenced by Sequence Number in the Composition Section

Seq.	Limit
01	5 mg/m3 TWA-OSHA (MINERAL OIL MIST)
01	5 mg/m3 TWA-ACGIH (MINERAL OIL MIST)
01	10 mg/m3 STEL ACGIH (MINERAL OIL MIST)
02	5 mg/m3 TWA-OSHA (MINERAL OIL MIST)
02	5 mg/m3 TWA-ACGIH (MINERAL OIL MIST)
02	10 mg/m3 STEL ACGIH (MINERAL OIL MIST)
03	5 mg/m3 TWA-OSHA (MINERAL OIL MIST)
03	5 mg/m3 TWA-ACGIH (MINERAL OIL MIST)
03	10 mg/m3 STEL ACGIH (MINERAL OIL MIST)

PAGE: 1

N.D. - NOT DETERMINED

N.A. - NOT APPLICABLE

N.T. - NOT TESTED

< - LESS THAN

> - GREATER THAN



PRODUCT CODE: 01854
NAME: ATF MERCON/DEXRON III

Date Issued: 1998-01-06
Supersedes: 1997-07-15

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Appearance:
Red liquid
Odor:
Slight additive odor

WARNING STATEMENT

NONE CONSIDERED NECESSARY

HMIS		NFPA	
Health: 1	Reactivity: 0	Health: 1	Reactivity: 0
Flammability: 1	Special: -	Flammability: 1	Special: -

POTENTIAL HEALTH EFFECTS

	EYE	SKIN	INHALATION	INGESTION
Primary Route of Exposure:	X	X	X	-

EFFECTS OF OVEREXPOSURE

Acute:

Eyes:

May cause minimal irritation, experienced as temporary discomfort.

Skin:

Brief contact may cause slight irritation. Prolonged contact, as with clothing wetted with material, may cause more severe irritation and discomfort, seen as local redness and swelling.

Other than the potential skin irritation effects noted above, acute (short term) adverse effects are not expected from brief skin contact; see other effects, below, and Section 11 for information regarding potential long term effects.

Inhalation:

Vapors or mist, in excess of permissible concentrations, or in unusually high concentrations generated from spraying, heating the material or as from exposure in poorly ventilated areas or confined spaces, may cause irritation of the nose and throat, headache, nausea, and drowsiness.

Ingestion:

If more than several mouthfuls are swallowed, abdominal discomfort, nausea, and diarrhea may occur.

Sensitization Properties:

Unknown.

Chronic:

No adverse effects have been documented in humans as a result of chronic exposure. Section 11 may contain applicable animal data.

Medical Conditions Aggravated by Exposure:

Because of its irritating properties, repeated skin contact may aggravate an existing dermatitis (skin condition).

Other Remarks:

None

4. FIRST AID MEASURES

Eyes:

Flush eyes with plenty of water for several minutes. Get medical attention if eye irritation persists.

Skin:

Wash skin with plenty of soap and water for several minutes. Get medical attention if skin irritation develops or persists.

Ingestion:

If more than several mouthfuls of this material are swallowed, give two glasses of water (16 oz.). Get medical attention.

PAGE: 2

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PRODUCT CODE: 01854
NAME: ATF MERCON/DEXRON III

Date Issued: 1998-01-06
Supersedes: 1997-07-15

4. FIRST AID MEASURES (CONT)

Inhalation:

If irritation, headache, nausea, or drowsiness occurs, remove to fresh air. Get medical attention if breathing becomes difficult or respiratory irritation persists.

Other Instructions:

Remove and dry-clean or launder clothing soaked or soiled with this material before reuse. Dry cleaning of contaminated clothing may be more effective than normal laundering. Inform individuals responsible for cleaning of potential hazards associated with handling contaminated clothing.

5. FIRE-FIGHTING MEASURES

Ignition Temperature - AIT (degrees F):

Not determined.

Flash Point (degrees F):

> 350 (COC)

Flammable Limits (%):

Lower: Not determined.

Upper: Not determined.

Recommended Fire Extinguishing Agents And Special Procedures:

Use water spray, dry chemical, foam, or carbon dioxide to extinguish flames. Use water spray to cool fire-exposed containers. Water or foam may cause frothing.

Unusual or Explosive Hazards:

None

Extinguishing Media Which Must Not Be Used:

Not determined.

Special Protective Equipment for Firefighters:

Wear full protective clothing and positive pressure breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES (Transportation Spills: CHEMTREC (800)424-9300)

Procedures in Case of Accidental Release, Breakage or Leakage:

Ventilate area. Avoid breathing vapor. Wear appropriate personal protective equipment, including appropriate respiratory protection. Contain spill if possible. Wipe up or absorb on suitable material and shovel up. Prevent entry into sewers and waterways. Avoid contact with skin, eyes or clothing.

If more than 1,333,333 pounds of product is spilled, then report spill according to SARA 304 and/or CERCLA 102(a) requirements, unless product qualifies for the petroleum exemption (CERCLA Section 101(14)).

7. HANDLING AND STORAGE

Precautions to be Taken in

Handling:

Minimum feasible handling temperatures should be maintained.

Storage:

Periods of exposure to high temperatures should be minimized. Water contamination should be avoided.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective Equipment (Type)

Eye/Face Protection:

Safety glasses, chemical type goggles, or face shield recommended to prevent eye contact.

Skin Protection:

Workers should wash exposed skin several times daily with soap and water. Soiled work clothing should be laundered or dry-cleaned.

PAGE: 3

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PRODUCT CODE: 01854
NAME: ATF MERCON/DEXRON III

Date Issued: 1998-01-06
Supersedes: 1997-07-15

8. EXPOSURE CONTROLS/PERSONAL PROTECTION (CONT)

Respiratory Protection:

Airborne concentrations should be kept to lowest levels possible. If vapor, mist or dust is generated and the occupational exposure limit of the product, or any component of the product, is exceeded, use appropriate NIOSH or MSHA approved air purifying or air supplied respirator after determining the airborne concentration of the contaminant. Air supplied respirators should always be worn when airborne concentration of the contaminant or oxygen content is unknown.

Ventilation:

Adequate to meet component occupational exposure limits (see Section 2).

Exposure Limit for Total Product:

None established for product; refer to Section 2 for component exposure limits.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Red liquid

Odor:

Slight additive odor

Boiling Point (degrees F):

Not determined.

Melting/Freezing point (degrees F):

Not applicable.

Specific Gravity (water=1):

.869

pH of undiluted product:

Not applicable.

Vapor Pressure:

Not determined.

Viscosity:

> 20 cSt at 40.0 C

VOC Content:

38 g/L

Vapor Density (air=1):

Not determined.

Solubility in Water (%):

Not determined.

Other: None

10. STABILITY AND REACTIVITY

This Material Reacts Violently With:

(If Others is checked below, see comments for details)

Air Water Heat Strong Oxidizers Others None of These

X

Comments:

None

Products Evolved When Subjected to Heat or Combustion:

Toxic levels of carbon monoxide, carbon dioxide, irritating aldehydes and ketones.

Hazardous Polymerizations: DO NOT OCCUR

PAGE: 4

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NAME: ATF MERCON/DEXRON III

Date Issued: 1998-01-06
Supersedes: 1997-07-15

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION (ANIMAL TOXICITY DATA)

Median Lethal Dose

Oral:

LD50 Believed to be > 5.00 g/kg (rat) practically non-toxic

Inhalation:

Not determined.

Dermal:

LD50 Believed to be > 2.00 g/kg (rabbit) practically non-toxic

Irritation Index, Estimation of Irritation (Species)

Skin:

(Draize) Believed to be > .50 - 3.00 /8.0 (rabbit) slightly irritating

Eyes:

(Draize) Believed to be < 15.00 /110 (rabbit) no appreciable effect

Sensitization:

Not determined.

Other:

Some low viscosity naphthenic oils have caused skin irritation and skin tumors in laboratory animals when repeatedly applied and left in place between applications. The significance of this effect to humans has not been established.

12. DISPOSAL CONSIDERATIONS

Waste Disposal Methods

This product has been evaluated for RCRA characteristics and does not meet the criteria of a hazardous waste if discarded in its purchased form. Under RCRA, it is the responsibility of the user of the product to determine at the time of disposal, whether the product meets RCRA criteria for hazardous waste. This is because product uses, transformations, mixtures, processes, etc. may render the resulting materials hazardous.

Remarks

None

13. TRANSPORT INFORMATION

Transportation

DOT:

Proper Shipping Name:

Not regulated

IMDG:

Proper Shipping Name:

Not regulated

ICAO:

Proper Shipping Name:

Not regulated

TDG:

Proper Shipping Name:

Not regulated

14. REGULATORY INFORMATION

Federal Regulations:

SARA Title III:

Section 302/304 Extremely Hazardous Substances

Seq.	Chemical Name	CAS Number	Range in %
01	Hydrochloric acid	7647-01-0	0.004725

Section 302/304 Extremely Hazardous Substances (CONT)

Seq.	TPQ	RQ
01	500	5000

Section 311 Hazardous Categorization:

Acute	Chronic	Fire	Pressure	Reactive	N/A
-	-	-	-	-	X

PAGE: 5

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PRODUCT CODE: 01854
NAME: ATF MERCON/DEXRON III

Date Issued: 1998-01-06
Supersedes: 1997-07-15

14. REGULATORY INFORMATION (CONT)

Section 313 Toxic Chemical

Chemical Name	CAS Number	Concentration
None		

CERCLA 102(a)/DOT Hazardous Substances: (+ indicates DOT Hazardous Substance)

Seq.	Chemical Name	CAS Number	Range in %
01+	Xylene	1330-20-7	0.0075
02+	Phosphoric acid	7664-38-2	0.004725
03+	Hydrochloric acid	7647-01-0	0.004725
04+	Propenoic acid, ethyl ester	140-88-5	0.004725
05+	Ethylbenzene	100-41-4	0.001675

CERCLA/DOT Hazardous Substances (Sequence Numbers and RQ's):

Seq.	RQ
01+	100
02+	5000
03+	5000
04+	1000
05+	1000

TSCA Inventory Status:

This product, or its components, are listed on or are exempt from the Toxic Substance Control Act (TSCA) Chemical Substance Inventory.

Other:

Texaco has performed a risk assessment on this product which indicates that no California Proposition 65 warnings are required.

State Regulations:

California Proposition 65:

The following detectable components of this product are substances, or belong to classes of substances, known to the State of California to cause cancer and/or reproductive toxicity.

Chemical Name	CAS Number
Propenoic acid, ethyl ester	140-88-5

International Regulations:

WHMIS Classification:

Not controlled

Canada Inventory Status:

This product, or its components, are listed on or are exempt from the Canadian Domestic Substance List (DSL).

EINECS Inventory Status:

Not determined.

Australia Inventory Status:

Not determined.

Japan Inventory Status:

Not determined.

15. ENVIRONMENTAL INFORMATION

Aquatic Toxicity:

Not determined.

Mobility:

Not determined.

Persistence and Biodegradability:

Not determined.

Potential to Bioaccumulate:

Not evaluated.

Remarks:

Not evaluated.

PAGE: 6

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PRODUCT CODE: 01854
NAME: ATF MERCON/DEXRON III

Date Issued: 1998-01-06
Supersedes: 1997-07-15

16. OTHER INFORMATION

None

THE INFORMATION CONTAINED HEREIN IS BELIEVED TO BE ACCURATE. IT IS PROVIDED INDEPENDENTLY OF ANY SALE OF THE PRODUCT FOR PURPOSE OF HAZARD COMMUNICATION AS PART OF TEXACO'S PRODUCT SAFETY PROGRAM. IT IS NOT INTENDED TO CONSTITUTE PERFORMANCE INFORMATION CONCERNING THE PRODUCT. NO EXPRESS WARRANTY, OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS MADE WITH RESPECT TO THE PRODUCT OR THE INFORMATION CONTAINED HEREIN. DATA SHEETS ARE AVAILABLE FOR ALL TEXACO PRODUCTS. YOU ARE URGED TO OBTAIN DATA SHEETS FOR ALL TEXACO PRODUCTS YOU BUY, PROCESS, USE OR DISTRIBUTE AND YOU ARE ENCOURAGED AND REQUESTED TO ADVISE THOSE WHO MAY COME IN CONTACT WITH SUCH PRODUCTS OF THE INFORMATION CONTAINED HEREIN.

TO DETERMINE APPLICABILITY OR EFFECT OF ANY LAW OR REGULATION WITH RESPECT TO THE PRODUCT, USER SHOULD CONSULT HIS LEGAL ADVISOR OR THE APPROPRIATE GOVERNMENT AGENCY. TEXACO DOES NOT UNDERTAKE TO FURNISH ADVICE ON SUCH MATTERS.

Date: 1998-01-06 New X Revised, Supersedes: 1997-07-15
Date printed: 1998-06-03

Inquiries regarding MSDS should be directed to:

Texaco Inc.
Manager, Product Safety
P.O. Box 509
Beacon, N.Y. 12508

PLEASE SEE NEXT PAGE FOR PRODUCT LABEL

PAGE: 7

N.D. - NOT DETERMINED
< - LESS THAN

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N.T. - NOT TESTED

PRODUCT CODE: 01854
NAME: ATF MERCON/DEXRON III

Date Issued: 1998-01-06
Supersedes: 1997-07-15



17. PRODUCT LABEL

Label Date: 1998-01-06

READ AND UNDERSTAND MATERIAL SAFETY DATA SHEET BEFORE HANDLING OR DISPOSING OF PRODUCT. THIS LABEL COMPLIES WITH THE REQUIREMENTS OF THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) FOR USE IN THE WORKPLACE. THIS LABEL IS NOT INTENDED TO BE USED WITH PACKAGING INTENDED FOR SALE TO CONSUMERS AND MAY NOT CONFORM WITH THE REQUIREMENTS OF THE CONSUMER PRODUCT SAFETY ACT OR OTHER RELATED REGULATORY REQUIREMENTS.

01854 ATF MERCON/DEXRON III

WARNING STATEMENT

NONE CONSIDERED NECESSARY

PRECAUTIONARY MEASURES

- Avoid prolonged breathing of vapor, mist, or gas.
- Workers should wash exposed skin several times daily with soap and water.

FIRST AID

Eye Contact:

Flush eyes with plenty of water for several minutes. Get medical attention if eye irritation persists.

Skin Contact:

Wash skin with plenty of soap and water for several minutes. Get medical attention if skin irritation develops or persists.

Ingestion:

If more than several mouthfuls of this material are swallowed, give two glasses of water (16 oz.). Get medical attention.

Inhalation:

If irritation, headache, nausea, or drowsiness occurs, remove to fresh air. Get medical attention if breathing becomes difficult or respiratory irritation persists.

Note to Physician:

None

FIRE

In case of fire, use water spray, dry chemical, foam or carbon dioxide. Water may cause frothing. Use water spray to cool fire-exposed containers.

If more than 1,333,333 pounds of product is spilled, then report spill according to SARA 304 and/or CERCLA 102(a) requirements, unless product qualifies for the petroleum exemption (CERCLA Section 101(14)).

	<u>Chemical Name</u>	<u>CAS Number</u>	<u>Range in %</u>
#	Solvent-dewaxed heavy paraffinic petroleum distillates	64742-65-0	35.00-49.99
#	Hydrotreated light paraffinic petroleum distillate	64742-55-8	35.00-49.99
#	Hydrotreated light naphthenic petroleum distillates	64742-53-6	1.00-2.99
*	Polymethacrylate	50867-55-5	1.00-2.99
*	Boronated substituted succinimide		1.00-2.99

PRODUCT IS NON-HAZARDOUS ACCORDING TO OSHA (1910.1200).

* COMPONENT IS HAZARDOUS ACCORDING TO OSHA.

COMPONENT, BY DEFINITION, IS CONSIDERED HAZARDOUS ACCORDING TO OSHA BECAUSE IT CARRIES THE PERMISSIBLE EXPOSURE LIMIT (PEL) FOR MINERAL OIL MIST.

<u>Pennsylvania Special Hazardous Substance(s)</u>	<u>CAS Number</u>	<u>Range in %</u>
None		

HMIS

Health: 1 Reactivity: 0
Flammability: 1 Special : -

NFPA

Health: 1 Reactivity: 0
Flammability: 1 Special : -

Transportation

DOT:

Proper Shipping Name:
Not regulated

PAGE: 8

N.D. - NOT DETERMINED
< - LESS THAN

N.A. - NOT APPLICABLE
> - GREATER THAN

N.T. - NOT TESTED

Date Issued: 1998-01-06
Supersedes: 1997-07-15

17. PRODUCT LABEL (CONT)

Label Date: 1998-01-06

CAUTION: Misuse of empty containers can be hazardous. Empty containers can be hazardous if used to store toxic, flammable, or reactive materials. Cutting or welding of empty containers might cause fire, explosion or toxic fumes from residues. Do not pressurize or expose to open flame or heat. Keep container closed and drum bungs in place.

Manufacturer's Name and Address:
TEXACO LUBRICANTS COMPANY
P.O. Box 4427
Houston, TX 77210-4427

TRANSPORTATION EMERGENCY Company: (914) 831-3400
CHEMTREC: (800) 424-9300

HEALTH EMERGENCY Company: (914) 831-3400

APPENDIX D

**SUMMARY OF WATER REQUIREMENT CALCULATIONS FOR THE MILL/TDF
SITE**



Subject	Crown Resources/Dry Gulch
Deterministic Water Balance	

Made by	PJS
Checked by	SHM
Approved by	

Job No	023-2002.4
Date	3/5/03 rev. 5/27/03
Sheet No	1 of 5

OBJECTIVE:

- Conduct a deterministic water balance for the Dry Gulch Site tailings impoundment to evaluate the amount of make-up water required to assist in sizing the associated make-up pond.
- Conduct a sensitivity analysis on the discharge tailings density, assuming values of 45, 50, and 55 percent.
- Calculate the make-up requirements assuming 100% re-circulation and 75% re-circulation of tailings fluids.
- Compare the make-up requirements for initially partially-full and full fresh water pond (currently sized at approximately 73.6 MGal).

METHOD:

- Golder Associate Inc.'s water balance spreadsheet, *WATBAL*. Use of the spreadsheet is discussed in SME (2000).

GIVEN:

- Latest tailings embankment grading plan, dated 5/20/03 (Golder Drawing 0232002A024, Rev. A);
- Tailings production – 1500 tons per day (1361 tonnes/day) (Golder, 2003);
- Use average monthly precipitation from the nearby Chesaw site (Golder, 1996):

Month	(in/month)	(mm/month)
January	1.25	31.8
February	0.90	22.9
March	0.75	19.1
April	1.05	26.7
May	1.54	39.1
June	1.60	40.6
July	0.86	21.8
August	1.31	33.3
September	1.00	25.4
October	0.71	18.0
November	1.29	32.8
December	1.66	42.2



Subject	Crown Resources/Dry Gulch
Deterministic Water Balance	

Made by	PJS
Checked by	SHM
Approved by	

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- Estimated average monthly lake evaporation values for the site, whereby the lake evaporation is assumed to be equal to 0.7 times the pan evaporation (Golder, 1996):

Month	(in/month)	(mm/month)
January	0.08	2.03
February	0.12	3.05
March	0.61	15.5
April	1.66	42.2
May	3.17	80.5
June	4.22	107.2
July	5.44	138.2
August	4.39	111.5
September	2.69	68.3
October	1.03	26.2
November	0.00	0.00
December	0.00	0.00

- Make-up water may be obtained from Myers Creek, if necessary. The estimated annual monthly flows (cfs) of nearby Myers Creek is as follows (Golder, 1996):

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
3.8	6.2	9.4	9.8	21.8	20.1	7.0	3.9	3.9	3.7	4.7	3.8

ASSUMPTIONS:

- Initial volume of water required at the process plant for slurry production is not accounted for in the simulation;
- Area of wetted tailings (i.e., decant pond) is approximately 30% of total tailings pond area;
- Pond areas are constant;
- Operational density of tailings is 70 pcf (1.12 tonnes/m³);
- Tailings tonnage and deposited density are constant;
- Site is a zero discharge site (i.e., estimated seepage losses is zero);
- No other inflows or outflows; complete (100%) diversion of water from the upstream water basin (i.e., runoff factor for virgin land in basin is 0, miscellaneous inflows is zero);
- Runoff factor for tailings and ponds is 100% of precipitation;



Subject	Crown Resources/Dry Gulch
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- Runoff and evaporation are constant;
- Discharge tailings slurry density of 45, 50, or 55%;
- Runoff period is 12 months long (i.e., snow melts the month it is deposited);
- Recirculation to the mill is 100% of the discharge water (calculate 75% re-circulation manually);
- No water is decanted;
- Start of simulation is January;
- Tailings do not displace pond;
- Initial pond volume (end of December) for full make-up pond scenario is 914,580 m³, and 457,300 m³ for partially full make-up pond scenario;
- Pond volume is maintained; and
- Others, as stated.

CALCULATIONS:

- Tailings water content:
 - The water retained in tailings is required in the *WATBAL* spreadsheet;
 - Assuming tailings are 100% saturated, and that the specific gravity of tailings solids is 2.70:
 - Tailings water content, $w_t = S \times [(\rho_w/\rho_d) - (1/SG)] = 1.0 \times [(62.4\text{pcf}/70\text{pcf}) - (1/2.7)] = 0.52 \rightarrow 52\%$
- Area of tailings and ponds:
 - Using the AutoCad "list" routine, the surface area of the tailings pond is:
 - $A_{t\&p} = (1,694,823 \text{ ft}^2) / (1.0764\text{E}5 \text{ ft}^2/\text{ha}) = 15.7 \text{ ha}$
 - Using the AutoCad "list" routine, the surface area of the make-up pond is:
 - $A_{t\&p} = (349,854 \text{ ft}^2) / (1.0764\text{E}5 \text{ ft}^2/\text{ha}) = 3.3 \text{ ha}$
 - The total surface area (for the precipitation catch-basin) is: 19 ha
- Area of wetted tails and ponds (for evaporation estimate):

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	Deterministic Water Balance	Checked by SHM	Date 3/5/03 rev. 5/27/03
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- For full make-up pond (El. 3397) scenario with 30% wetted tailings:

- $A_{wt\&p} = [0.3 \times 15.7 \text{ ha}] + [(332,825 \text{ ft}^2) / (1.0764\text{E}5 \text{ ft}^2/\text{ha})] = 7.8 \text{ ha}$

- For make-up pond filled to El. 3375 and 30% wetted tailings:

- $A_{wt\&p} = 4.7 \text{ ha} + [(218,875 \text{ ft}^2) / (1.0764\text{E}5 \text{ ft}^2/\text{ha})] = 6.7 \text{ ha}$

- Parameters were entered into the *WATBAL* spreadsheet. Results from each of the simulations are presented in Tables 1 through 3 and Figures 1 through 3.

RESULTS:

Based on the assumptions presented herein, the fluid losses are larger than the inflows over the 12 month period for all scenarios. The total volume of water required to process the tailings slurry, the make-up water required for each of the various slurry densities and make-up pond volumes to maintain a constant pond volume, and the percent of water that can be recycled to maintain a constant pond volume is as follows:

I. Best-Case Scenario (100% Re-circulation / No Losses)

Tailings Slurry Density	Volume Water Required at Process Plant (m ³ /year)	Full Make-up Pond Scenario			Half-Full Make-up Pond Scenario		
		Net Loss (Total Make-up)		Actual Percentage of Recirculated Water	Net Loss (Total Make-up)		Actual Percentage of Recirculated Water
		(m ³ /year)	(gpm / cfs)		(m ³ /year)	(gpm / cfs)	
55%	406,444	237,500	119.5/0.26	41.6%	230,958	116.2/ 0.26	43.2%
50%	496,765			52.2%			53.5%
45%	607,157			60.9%			62.0%

II. Base-Case Scenario (75% Re-circulation / 25% Losses):

Tailings Slurry Density	Volume Water Required at Process Plant (m ³ /year)	Full Make-up Pond Scenario			Half-Full Make-up Pond Scenario		
		Net Loss (Total Make-up)		Actual Percentage of Recirculated Water	Net Loss (Total Make-up)		Actual Percentage of Recirculated Water
		(m ³ /year)	(gpm / cfs)		(m ³ /year)	(gpm / cfs)	
55%	406,444	296,875	149.4 / 0.33	27.0%	288,698	145.3/ 0.32	29.0%
50%	496,765			40.2%			41.9%
45%	607,157			51.1%			52.5%



Subject	Crown Resources/Dry Gulch
Deterministic Water Balance	

Made by	PJS
Checked by	SHM
Approved by	

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CONCLUSIONS:

The make-up water may be acquired from the Myers Creek drainage located adjacent to the facility, through legal water rights. Throughout the year, the flow of Myers Creek is substantially larger than the amount of make-up required to the facility (i.e., maximum 0.33 cfs compared to 3.7 cfs in October up to 21.8 cfs in May).

The minimum pond storage volume is equivalent to the annual solution make-up required. The pond should be sized to store a minimum of 155,000 m³ (40.9 MGal) of water.

REFERENCES:

Golder Associates Inc. (Golder) (1996) "Final Design Report, Tailings Disposal Facility, Crown Jewel Project, Okanogan County, Washington." Prepared for Battle Mountain Gold Company, Project No. 963-1315, 1 May 1996.

Golder Associates (1997) "Guidelines for Tailings Basin Water Balance Modeling and WATBAL Manual." WATBAL Release 4.0. 44 pp.

Golder Associates Inc. (Golder) (2003) "Scoping Level Tailings Siting Evaluation at Lost Creek Ranch, Buckhorn Project." Prepared for Crown Resources, Project No. 023-2002.4. 13 January 2003.

Society for Mining, Metallurgy, and Exploration, Inc. (SME) (2000) "Slope Stability in Surface Mining." Edited by W.A. Hustrulid, M.K. McCarter, and D.J.A. Van Zyl. 442 pp.

TABLE 1A
WATBAL PRINTOUT - PRECIPITATION VERSION
Crown Resources / Dry Gulch, Buckhorn Project

TABLE 1A
INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day	1361													499785
	Solids (by weight) in discharge	%	55													
	Miscellaneous inflows	m ³ /mo.	0													0
RUNOFF	Average precipitation	mm/mo.		31.8	22.8	19.1	26.7	39.1	40.6	21.8	33.3	25.4	18	32.8	42.2	353.7
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		31.8	22.8	19.1	26.7	39.1	40.6	21.8	33.3	25.4	18	32.8	42.2	353.7
	Area of virgin land in basin	ha	0													
	Runoff factor	%	0													
	Area of tailings and ponds	ha	19													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		100	100	100	100	100	100	100	100	100	100	100	100	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%														
	Deposited dry density	t/m ³	1.12													
LOSSES	Water retained in tailings (dry wt basis)	%	52													
	Estimated seepage losses	m ³ /mo.	0													
	Average Evaporation	mm/mo.		2.03	3.05	15.6	42.2	60.5	107.2	138.2	111.5	68.3	26.2	0	0	595
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		2.03	3.05	15.6	42.2	60.5	107.2	138.2	111.5	68.3	26.2	0	0	595
	Area of ponds and wetted tailings	ha	6.7													
	Recirculation to mill (% of process water)	%	100													
DECANT	Decant strategy (% of net inflow)	% / mo.														
	Initial water volume in ponds	m ³	457300													0

TABLE 1B
OUTPUT COMPUTATIONS

	INFLOWS (m ³ /mo.)				LOSSES (m ³ /mo.)				ACCUMULATION (m ³ /mo.)						(m ³)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained In Tailings	Seepage	Pond Evap.	Recirculation	Total	Net Inflow	Water Displaced	Change	Decant	Net Change	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															457300
Jan	34520	0	6042	40562	21838	0	138	34520	58595	-18033	0	-18033	0	-18033	441267
Feb	31179	0	4351	35530	19816	0	204	31179	51200	-15670	0	-15670	0	-15670	425597
Mar	34520	0	3829	38149	21939	0	1039	34520	57498	-18346	0	-18346	0	-18346	406248
Apr	33406	0	5073	38479	21232	0	2827	33406	57485	-18986	0	-18986	0	-18986	387262
May	34520	0	7429	41949	21939	0	5394	34520	61853	-18904	0	-18904	0	-18904	367358
Jun	33408	0	7714	41120	21232	0	7182	33408	61820	-20700	0	-20700	0	-20700	346659
Jul	34520	0	4142	38662	21939	0	9259	34520	65719	-27057	0	-27057	0	-27057	319602
Aug	34520	0	6327	40847	21939	0	7471	34520	63930	-23083	0	-23083	0	-23083	296519
Sep	33408	0	4828	38232	21232	0	4578	33408	59214	-20982	0	-20982	0	-20982	275537
Oct	34520	0	3420	37940	21939	0	1755	34520	58215	-20275	0	-20275	0	-20275	255263
Nov	33408	0	6232	39638	21232	0	0	33408	54638	-15000	0	-15000	0	-15000	240263
Dec	34520	0	8016	42536	21939	0	0	34520	58459	-13921	0	-13921	0	-13921	226342
TOTAL	408444	0	67203	475647	258318	0	39844	408444	704805	-230958	0	-230958	0	-230958	

WATBAL PRINTOUT - PRECIPITATION VERSION
Crown Resources / Dry Gulch, Buckhorn Project

Figure 1A
INFLOWS, LOSSES AND NET INFLOW

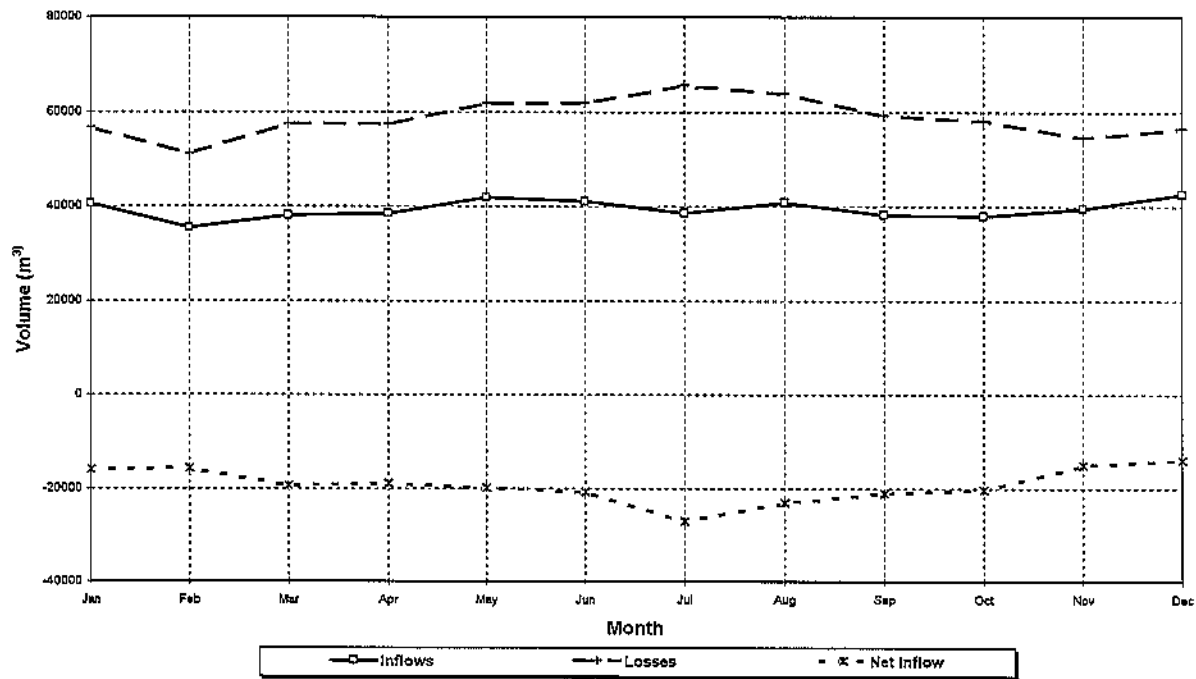


Figure 1B
DECANT AND POND VOLUME

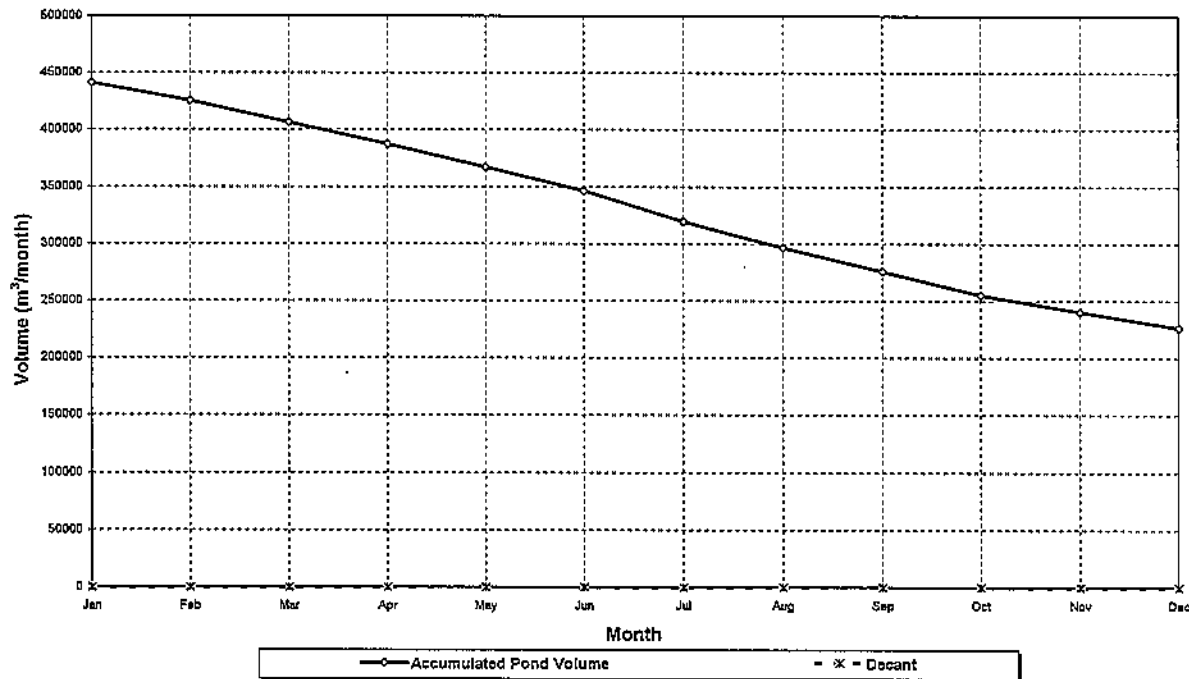


TABLE 1C
WATBAL PRINTOUT - PRECIPITATION VERSION
Crown Resources / Dry Gulch, Buckhorn Project

TABLE 1C
INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day	1381													488785
	Solids (by weight) In discharge	%	55													
	Miscellaneous inflows	m ³ /mo.	0													0
RUNOFF	Average precipitation	mm/mo.		31.8	22.9	19.1	26.7	39.1	40.8	21.8	33.3	25.4	18	32.8	42.2	353.7
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		31.8	22.9	19.1	26.7	39.1	40.8	21.8	33.3	25.4	18	32.8	42.2	353.7
	Area of virgin land in basin	ha	0													
	Runoff factor	%	0													
	Area of tailings and ponds	ha	19													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		100	100	100	100	100	100	100	100	100	100	100	100	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%														
	Deposited dry density	t/m ³	1.12													
LOSSES	Water retained in tailings (dry wt basis)	%	52													
	Estimated seepage losses	m ³ /mo.	0													
	Average Evaporation	mm/mo.		2.03	3.05	15.5	42.2	80.5	107.2	138.2	111.5	89.3	26.2	0	0	595
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		2.03	3.05	15.5	42.2	80.5	107.2	138.2	111.5	89.3	26.2	0	0	595
	Area of ponds and wetted tailings	ha	7.8													
	Recirculation to mill (% of process water)	%	100													
DECANT	Decant strategy (% of net inflow)	% / mo.														0
	Initial water volume in ponds	m ³	457300													

TABLE 1D
OUTPUT COMPUTATIONS

	INFLOWS (m ³ /mo.)				LOSSES (m ³ /mo.)					ACCUMULATION (m ³ /mo.)					(m ³)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirculation	Total	Net Inflow	Water Displaced	Change	Decant	Net Change	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															457300
Jan	34520	0	6042	40562	21939	0	159	34520	56618	-16058	0	-16058	0	-16058	441244
Feb	31179	0	4351	35530	19818	0	238	31179	51233	-15703	0	-15703	0	-15703	425541
Mar	34520	0	3628	38148	21939	0	1209	34520	57868	-18519	0	-18519	0	-18519	406022
Apr	33408	0	5073	38479	21232	0	3292	33408	57930	-18450	0	-19450	0	-19450	386572
May	34520	0	7429	41949	21939	0	6279	34520	62738	-20789	0	-20789	0	-20789	365782
Jun	33408	0	7714	41120	21232	0	8362	33408	63000	-21879	0	-21879	0	-21879	343903
Jul	34520	0	4142	38662	21939	0	10780	34520	67239	-28577	0	-28577	0	-28577	315326
Aug	34520	0	8327	40847	21939	0	8697	34520	85158	-24309	0	-24309	0	-24309	291017
Sep	33408	0	4826	38232	21232	0	5327	33408	59965	-21733	0	-21733	0	-21733	269284
Oct	34520	0	3420	37940	21939	0	2044	34520	56503	-20583	0	-20583	0	-20583	248721
Nov	33408	0	8232	39636	21232	0	0	33408	54836	-15000	0	-15000	0	-15000	233721
Dec	34520	0	8018	42538	21939	0	0	34520	58459	-13921	0	-13921	0	-13921	219800
TOTAL	408444	0	67203	473647	258318	0	48385	408444	711147	-237500	0	-237500	0	-237500	

WATBAL PRINTOUT - PRECIPITATION VERSION
Crown Resources / Dry Gulch, Buckhorn Project

Figure 1C
INFLOWS, LOSSES AND NET INFLOW

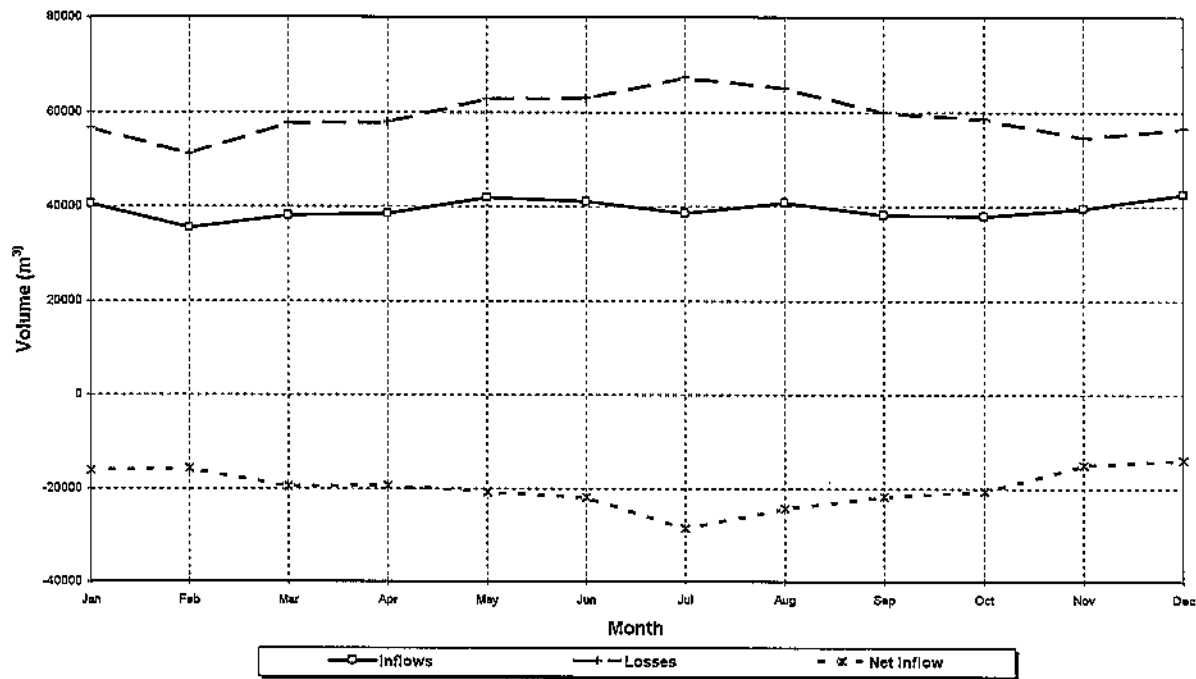


Figure 1D
DECANT AND POND VOLUME

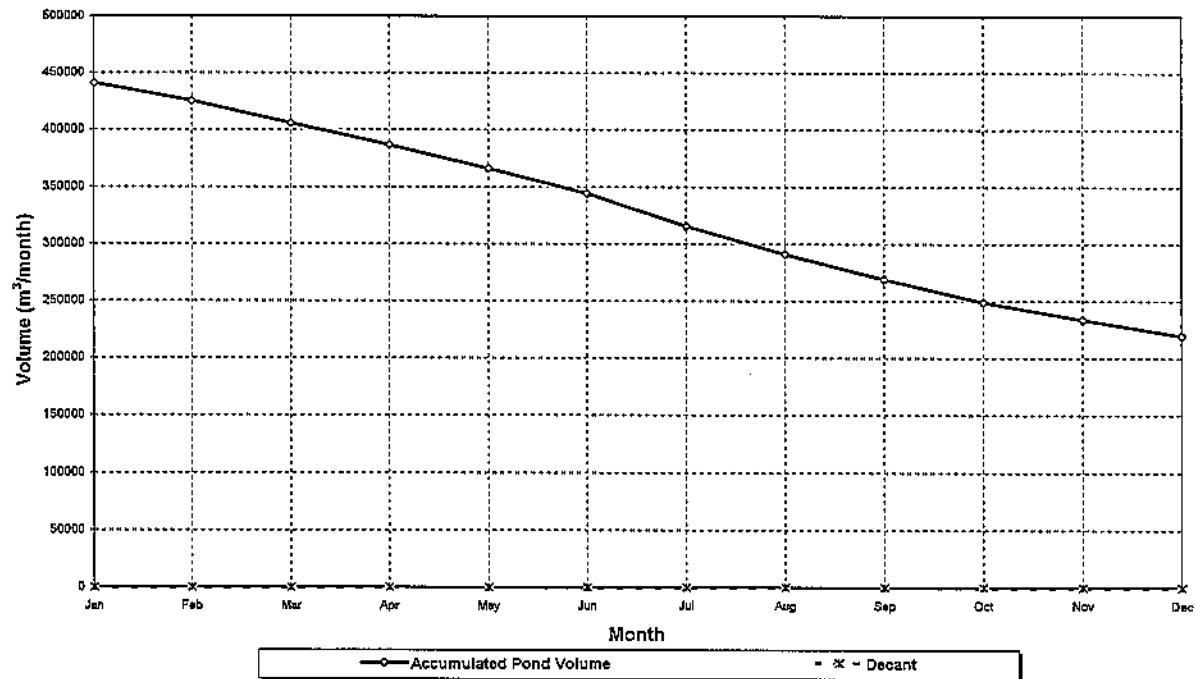


TABLE 2A
WATBAL PRINTOUT - PRECIPITATION VERSION
 Crown Resources / Dry Gulch, Buckhorn Project

TABLE 2A
 INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	1/day	1361													496765
	Solids (by weight) in discharge	%	50													
	Miscellaneous inflows	m ³ /mo.	0													0
RUNOFF	Average precipitation	mm/mo.		31.8	22.9	19.1	26.7	39.1	40.8	21.8	33.3	25.4	18	32.8	42.2	353.7
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		31.8	22.9	19.1	26.7	39.1	40.8	21.8	33.3	25.4	18	32.8	42.2	353.7
	Area of virgin land in basin	ha	0													
	Runoff factor	%	0													
	Area of tailings and ponds	ha	10													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		100	100	100	100	100	100	100	100	100	100	100	100	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%														
	Deposited dry density	t/m ³	1.12													
LOSSES	Water retained in tailings (dry wt basis)	%	52													
	Estimated seepage losses	m ³ /mo.	0													
	Average Evaporation	mm/mo.		2.03	3.05	15.5	42.2	60.5	107.2	136.2	111.5	86.3	26.2	0	0	595
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		2.03	3.05	15.5	42.2	60.5	107.2	136.2	111.5	86.3	26.2	0	0	595
	Area of ponds and wetted tailings	ha	8.7													
	Recirculation to mill (% of process water)	%	100													
DECANT	Decant strategy (% of net inflow)	% / mo.														0
	Initial water volume in ponds	m ³	457300													

TABLE 2B
 OUTPUT COMPUTATIONS

	INFLOWS				LOSSES					ACCUMULATION					
	(m ³ /mo.)				(m ³ /mo.)					(m ³ /mo.)					(m ³)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirculation	Total	Net Inflow	Water Displaced	Change	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															457300
Jan	42191	0	6042	48233	21939	0	138	42191	64269	-16033	0	-16033	0	-16033	441287
Feb	38108	0	4351	42459	19818	0	204	38108	58128	-15670	0	-15670	0	-15670	425597
Mar	42191	0	3629	45820	21939	0	1039	42191	65169	-19349	0	-19349	0	-19349	406248
Apr	40830	0	5073	45903	21232	0	2627	40830	64856	-16966	0	-16966	0	-16966	387282
May	42191	0	7429	49620	21939	0	5394	42191	69524	-19904	0	-19904	0	-19904	367359
Jun	40830	0	7714	48544	21232	0	7162	40830	69244	-20700	0	-20700	0	-20700	346659
Jul	42191	0	4142	46333	21939	0	9259	42191	73380	-27057	0	-27057	0	-27057	319602
Aug	42191	0	6327	48518	21939	0	7471	42191	71801	-23063	0	-23063	0	-23063	296519
Sep	40830	0	4828	45658	21232	0	4578	40830	66368	-20982	0	-20982	0	-20982	275537
Oct	42191	0	3420	45611	21939	0	1755	42191	65885	-20275	0	-20275	0	-20275	255263
Nov	40830	0	6232	47062	21232	0	0	40830	62062	-15000	0	-15000	0	-15000	240263
Dec	42191	0	8016	50209	21939	0	0	42191	64130	-13921	0	-13921	0	-13921	226342
TOTAL	486765	0	67203	553968	258318	0	38844	486765	794928	-230956	0	-230956	0	-230956	

WATBAL PRINTOUT - PRECIPITATION VERSION
Crown Resources / Dry Gulch, Buckhorn Project

Figure 2A
INFLOWS, LOSSES AND NET INFLOW

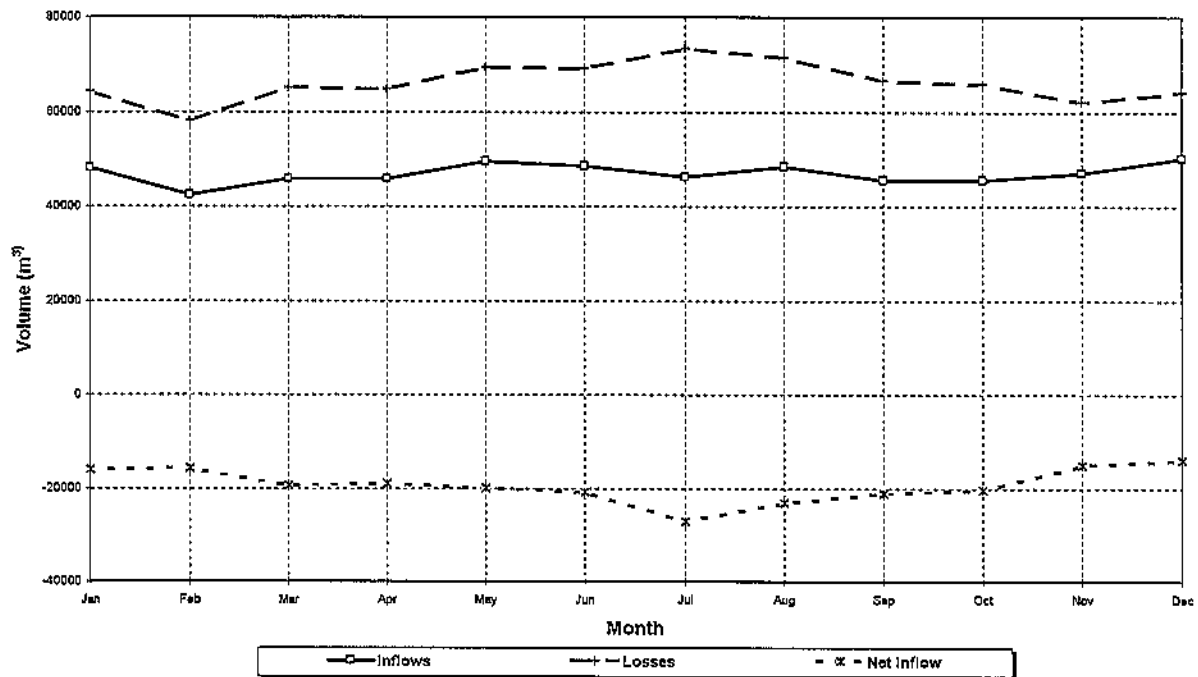


Figure 2B
DECANT AND POND VOLUME

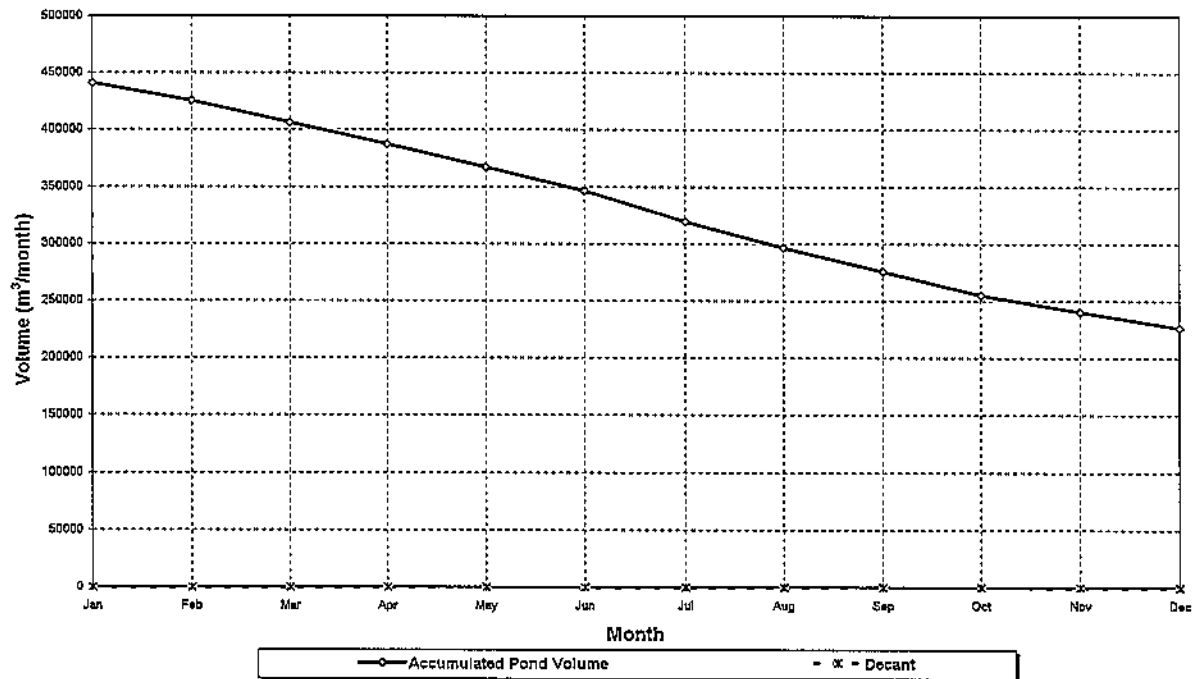


TABLE 2C
WATBAL PRINTOUT - PRECIPITATION VERSION
Crown Resources / Dry Gulch, Buckhorn Project

TABLE 2C
INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day	1361													496765
	Solids (by weight) in discharge	%	50													
	Miscellaneous inflows	m ³ /mo.	0													0
RUNOFF	Average precipitation	mm/mo.		31.8	22.9	19.1	26.7	39.1	40.6	21.8	33.3	25.4	18	32.8	42.2	353.7
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		31.8	22.9	19.1	26.7	39.1	40.6	21.8	33.3	25.4	18	32.8	42.2	353.7
	Area of virgin land in basin	ha	0													
	Runoff factor	%	0													
	Area of tailings and ponds	ha	18													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		100	100	100	100	100	100	100	100	100	100	100	100	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%														
	Deposited dry density	t/m ³	1.12													
LOSSES	Water retained in tailings (dry wt basis)	%	52													
	Estimated seepage losses	m ³ /mo.	0													
	Average Evaporation	mm/mo.		2.03	3.05	15.5	42.2	80.5	107.2	138.2	111.5	68.3	26.2	0	0	585
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		2.03	3.05	15.5	42.2	80.5	107.2	138.2	111.5	68.3	26.2	0	0	585
	Area of ponds and wetted tailings	ha	7.8													
	Recirculation to mill (% of process water)	%	100													
DECANT	Decant strategy (% of net inflow)	% / mo.														0
	Initial water volume in ponds	m ³	457300													

TABLE 2D

OUTPUT COMPUTATIONS

	INFLOWS				LOSSES					ACCUMULATION					
	(m ³ /mo.)				(m ³ /mo.)					(m ³ /mo.)					(m ³)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirculation	Total	Net Inflow	Water Displaced	Change	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															457300
Jan	42191	0	8042	48233	21939	0	158	42191	84289	-18056	0	-18056	0	-18056	441244
Feb	38108	0	4351	42459	19816	0	238	38108	58162	-15703	0	-15703	0	-15703	425541
Mar	42191	0	3828	45820	21939	0	1209	42191	65339	-19519	0	-19519	0	-19519	406022
Apr	40830	0	5073	45903	21232	0	3292	40830	65353	-19450	0	-19450	0	-19450	386572
May	42191	0	7429	49820	21939	0	8279	42191	70409	-20789	0	-20789	0	-20789	365782
Jun	40830	0	7714	48544	21232	0	8382	40830	70423	-21879	0	-21879	0	-21879	343903
Jul	42191	0	4142	46333	21939	0	10780	42191	74910	-28577	0	-28577	0	-28577	315326
Aug	42191	0	6327	48518	21939	0	8697	42191	72827	-24309	0	-24309	0	-24309	281017
Sep	40830	0	4828	45658	21232	0	5327	40830	67389	-21733	0	-21733	0	-21733	269284
Oct	42191	0	3420	45611	21939	0	2044	42191	68174	-20563	0	-20563	0	-20563	248721
Nov	40830	0	8232	47062	21232	0	0	40830	82082	-15000	0	-15000	0	-15000	233721
Dec	42191	0	8018	50209	21939	0	0	42191	54130	-13921	0	-13921	0	-13921	219800
TOTAL	496765	0	67203	563968	258318	0	49385	496765	801498	-237500	0	-237500	0	-237500	

WATBAL PRINTOUT - PRECIPITATION VERSION
Crown Resources / Dry Gulch, Buckhorn Project

Figure 2C
INFLOWS, LOSSES AND NET INFLOW

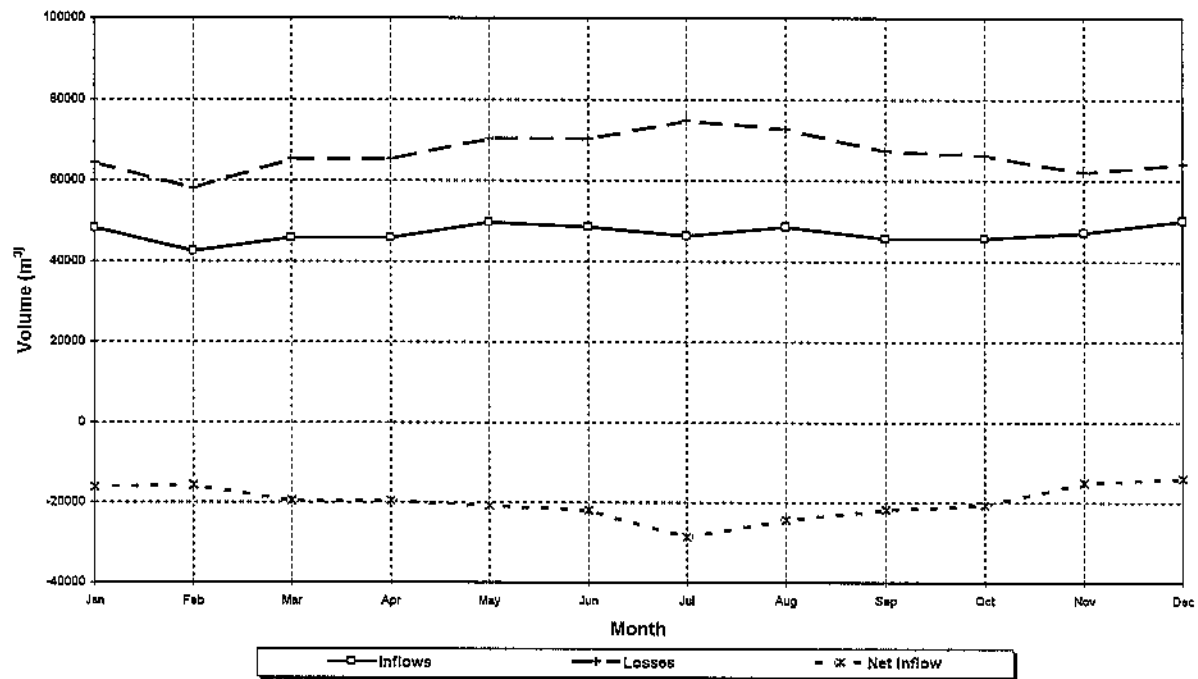


Figure 2D
DECANT AND POND VOLUME

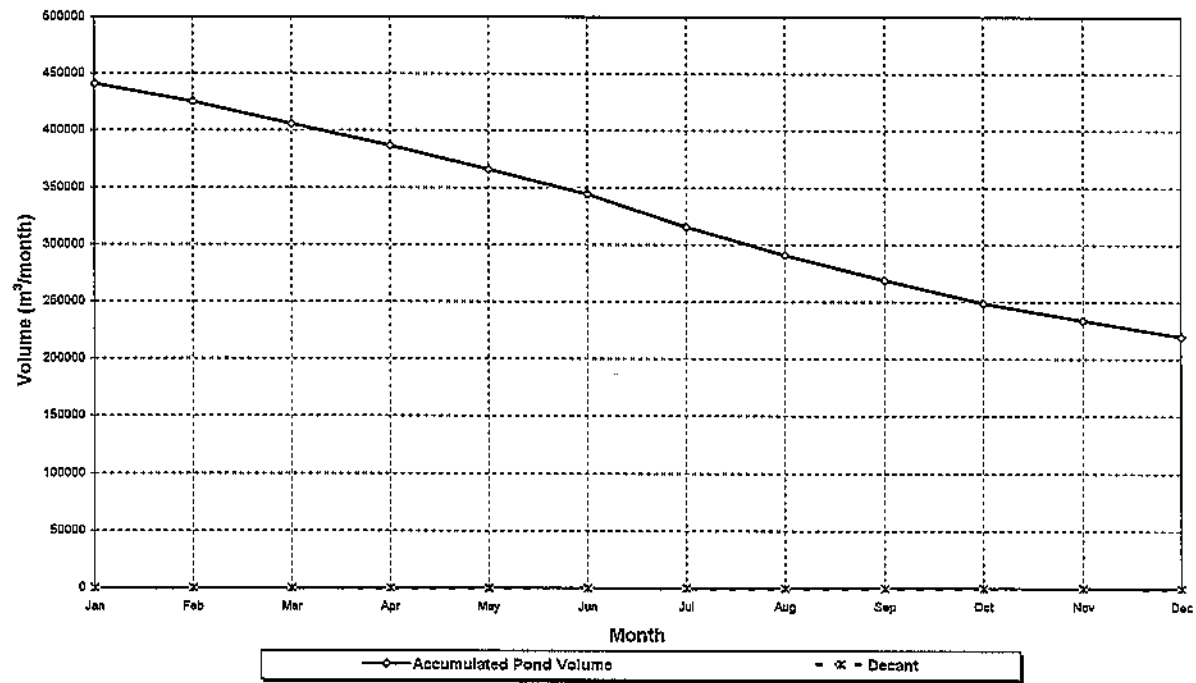


TABLE 3A
WATBAL PRINTOUT - PRECIPITATION VERSION
Crown Resources / Dry Gulch, Buckhorn Project

TABLE 3A
INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day	1361													496765
	Solids (by weight) in discharge	%	45													
	Miscellaneous inflows	m ³ /mo.	0													0
RUNOFF	Average precipitation	mm/mo.		31.8	22.9	19.1	28.7	39.1	40.8	21.8	33.3	25.4	18	32.8	42.2	353.7
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		31.8	22.9	19.1	28.7	39.1	40.8	21.8	33.3	25.4	18	32.8	42.2	353.7
	Area of virgin land in basin	ha	0													
	Runoff factor	%	0													
	Area of tailings and ponds	ha	19													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		100	100	100	100	100	100	100	100	100	100	100	100	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%														
	Deposited dry density	t/m ³	1.12													
LOSSES	Water retained in tailings (dry wt basis)	%	52													
	Estimated seepage losses	m ³ /mo.	0													
	Average Evaporation	mm/mo.		2.03	3.05	15.5	42.2	80.5	107.2	138.2	111.5	88.3	28.2	0	0	595
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		2.03	3.05	15.5	42.2	80.5	107.2	138.2	111.5	88.3	28.2	0	0	595
	Area of ponds and wetted tailings	ha	8.7													
	Recirculation to mill (% of process water)	%	100													
DECANT	Decant strategy (% of net inflow)	% / mo.														0
	Initial water volume in ponds	m ³	457300													

TABLE 3B

OUTPUT COMPUTATIONS

	INFLOWS				LOSSES					ACCUMULATION					
	(m ³ /mo.)				(m ³ /mo.)					(m ³ /mo.)					(m ³)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained In Tailings	Seepage	Pond Evap.	Recirculation	Total	Net Inflow	Water Displaced	Change	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															457300
Jan	51587	0	8042	57809	21839	0	138	51587	73842	-18033	0	-18033	0	-18033	441267
Feb	46578	0	4351	50927	19818	0	204	46578	88597	-15870	0	-15870	0	-15870	425597
Mar	51587	0	3629	55198	21939	0	1039	51587	74545	-18349	0	-18349	0	-18349	406248
Apr	49903	0	5073	54976	21232	0	2827	49903	73982	-18886	0	-18886	0	-18886	387282
May	51587	0	7429	58986	21839	0	5394	51587	78900	-19804	0	-19804	0	-19904	367359
Jun	49903	0	7714	57617	21232	0	7182	49903	78317	-20700	0	-20700	0	-20700	348859
Jul	51587	0	4142	55709	21839	0	9259	51587	82785	-27057	0	-27057	0	-27057	319802
Aug	51587	0	8327	57894	21839	0	7471	51587	80977	-23083	0	-23083	0	-23083	298519
Sep	49903	0	4826	54729	21232	0	4578	49903	75711	-20982	0	-20982	0	-20982	275537
Oct	51587	0	3420	54867	21839	0	1755	51587	75281	-20275	0	-20275	0	-20275	255263
Nov	49903	0	6232	56135	21232	0	0	49903	71135	-15000	0	-15000	0	-15000	240283
Dec	51587	0	8018	59565	21839	0	0	51587	73508	-13921	0	-13921	0	-13921	226342
TOTAL	607157	0	87203	674380	258318	0	39844	607157	905319	-230958	0	-230958	0	-230958	

WATBAL PRINTOUT - PRECIPITATION VERSION
Crown Resources / Dry Gulch, Buckhorn Project

Figure 3A
INFLOWS, LOSSES AND NET INFLOW

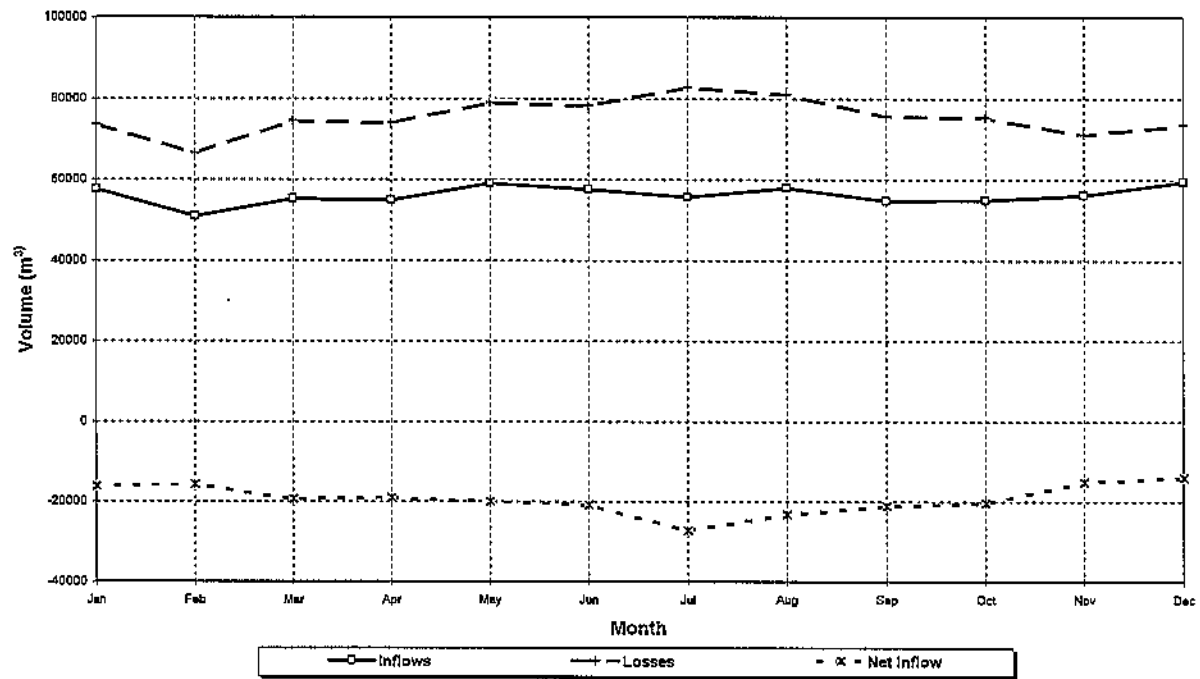


Figure 3B
DECANT AND POND VOLUME

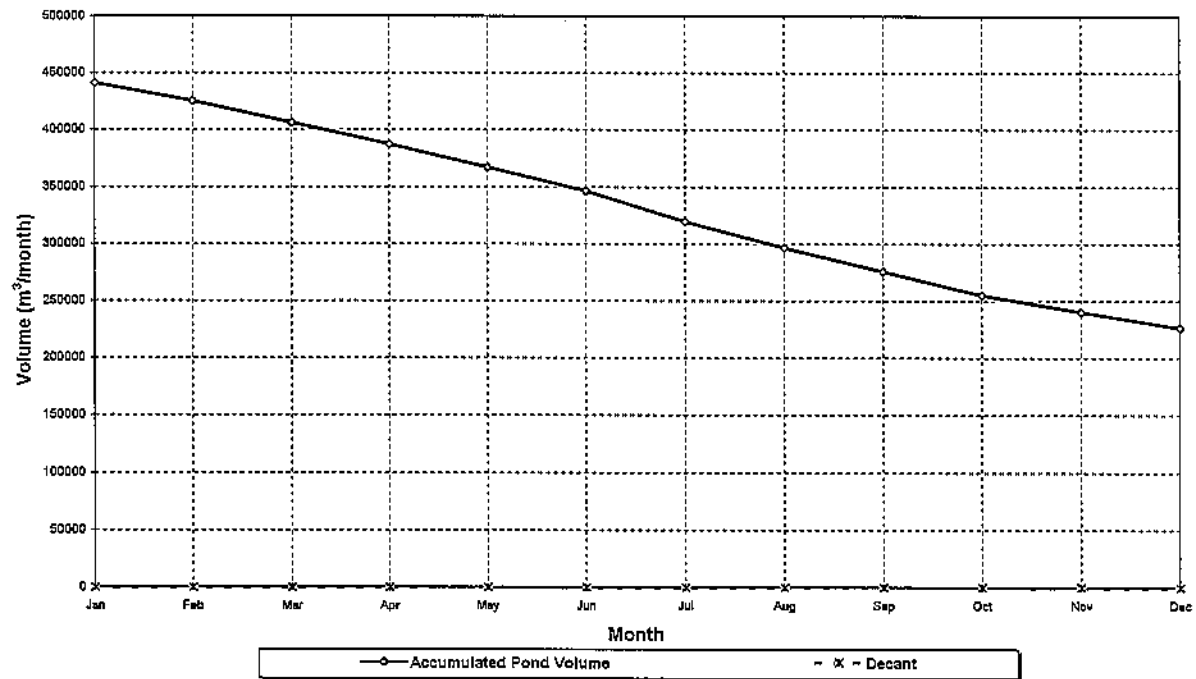


TABLE 3C
WATBAL PRINTOUT - PRECIPITATION VERSION
 Crown Resources / Dry Gulch, Buckhorn Project

TABLE 3C
 INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day	1381													496785
	Solids (by weight) in discharge	%	45													
	Miscellaneous inflows	m ³ /mo.	0													0
RUNOFF	Average precipitation	mm/mo.		31.8	22.9	19.1	26.7	39.1	40.8	21.8	33.3	25.4	18	32.8	42.2	353.7
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		31.8	22.9	19.1	26.7	39.1	40.8	21.8	33.3	25.4	18	32.8	42.2	353.7
	Area of virgin land in basin	ha	0													
	Runoff factor	%	0													
	Area of tailings and ponds	ha	19													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		100	100	100	100	100	100	100	100	100	100	100	100	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%														
	Deposited dry density	t/m ³	1.12													
LOSSES	Water retained in tailings (dry wt basis)	%	52													
	Estimated seepage losses	m ³ /mo.	0													
	Average Evaporation	mm/mo.		2.03	3.05	15.5	42.2	80.5	107.2	138.2	111.5	88.3	28.2	0	0	595
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		2.03	3.05	15.5	42.2	80.5	107.2	138.2	111.5	88.3	28.2	0	0	595
	Area of ponds and wetted tailings	ha	7.8													
	Recirculation to mill (% of process water)	%	100													
DECANT	Decant strategy (% of net inflow)	% / mo.														0
	Initial water volume in ponds	m ³	457300													

TABLE 3D

OUTPUT COMPUTATIONS

	INFLOWS				LOSSES					ACCUMULATION					
	(m ³ /mo.)				(m ³ /mo.)					(m ³ /mo.)					(m ³)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirculation	Total	Net Inflow	Water Displaced	Change	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															457300
Jan	51587	0	8042	57609	21939	0	158	51587	73884	-18058	0	-18058	0	-18058	441244
Feb	46578	0	4351	50927	19818	0	238	46578	68831	-15703	0	-15703	0	-15703	425541
Mar	51587	0	3829	55198	21939	0	1209	51587	74715	-19519	0	-19519	0	-19519	406022
Apr	49803	0	5073	54876	21232	0	3292	49803	74427	-19450	0	-19450	0	-19450	386572
May	51587	0	7429	58988	21939	0	6279	51587	78785	-20789	0	-20789	0	-20789	365782
Jun	49803	0	7714	57517	21232	0	8362	49803	79497	-21679	0	-21679	0	-21679	343903
Jul	51587	0	4142	55709	21939	0	10780	51587	84288	-26577	0	-26577	0	-26577	315326
Aug	51587	0	6327	57884	21939	0	8997	51587	82203	-24309	0	-24309	0	-24309	291017
Sep	49803	0	4828	54629	21232	0	5327	49803	76462	-21733	0	-21733	0	-21733	269284
Oct	51587	0	3420	54987	21939	0	2644	51587	75550	-20583	0	-20583	0	-20583	248721
Nov	49803	0	6232	56035	21232	0	0	49803	71135	-15000	0	-15000	0	-15000	233721
Dec	51587	0	8018	59595	21939	0	0	51587	73508	-13921	0	-13921	0	-13921	219800
TOTAL	807157	0	67203	874360	258318	0	49385	807157	911890	-237500	0	-237500	0	-237500	

WATBAL PRINTOUT - PRECIPITATION VERSION
Crown Resources / Dry Gulch, Buckhorn Project

Figure 3C
INFLOWS, LOSSES AND NET INFLOW

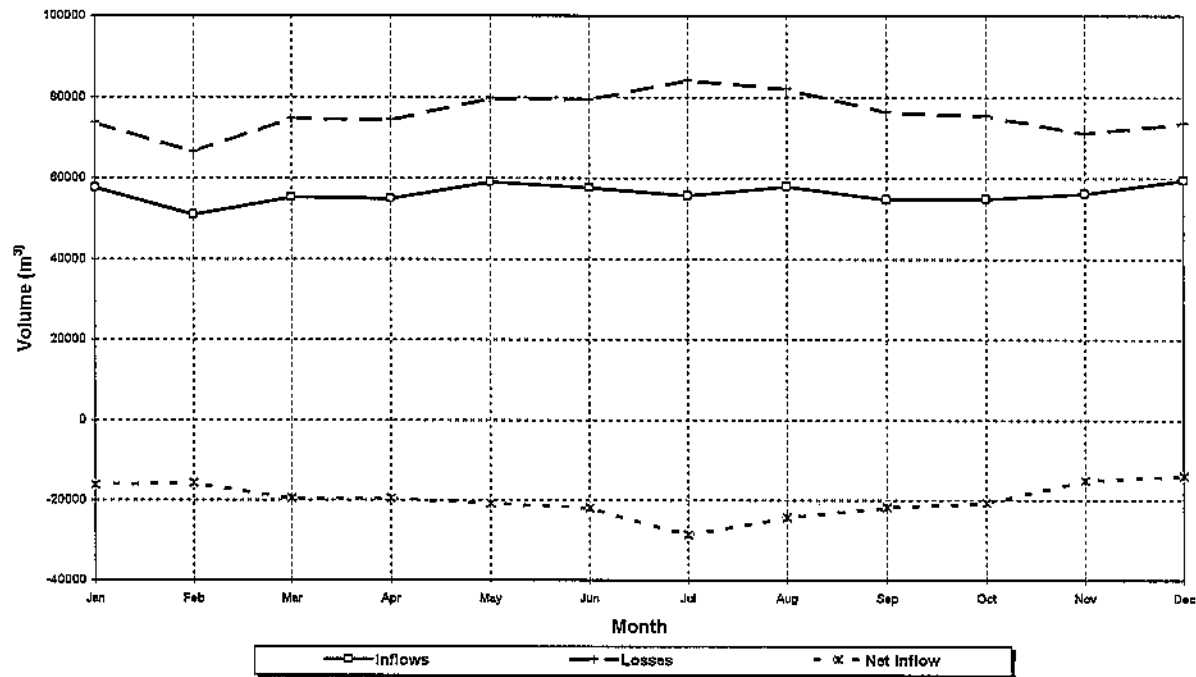
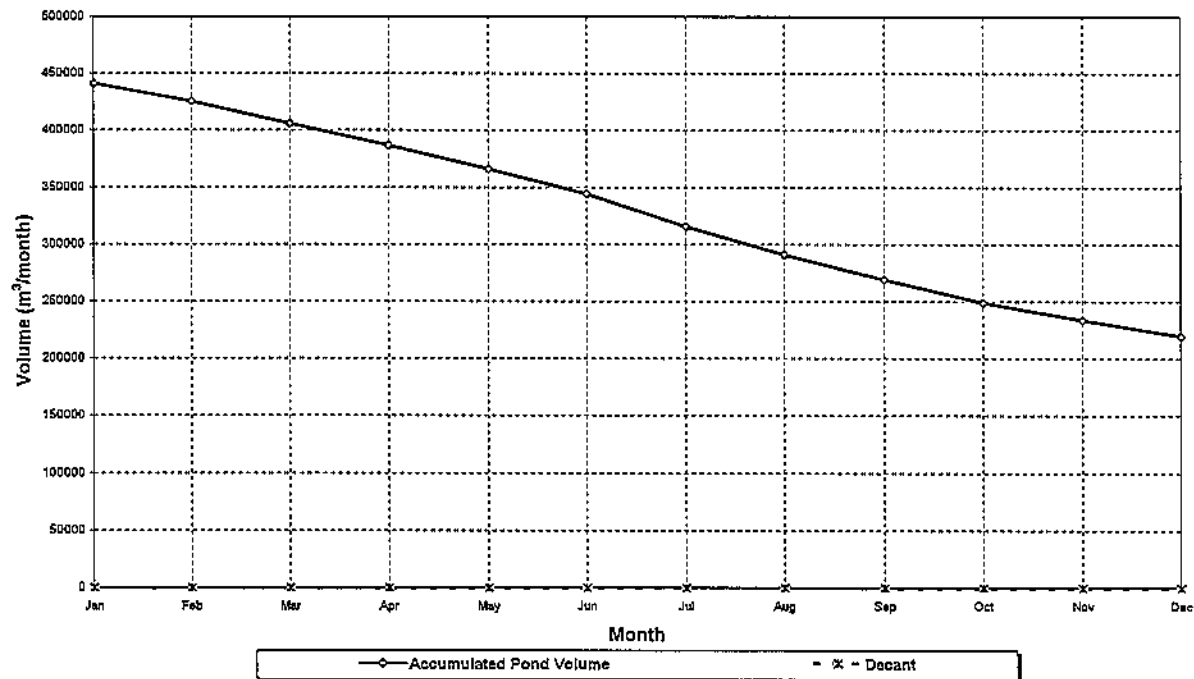


Figure 3D
DECANT AND POND VOLUME



APPENDIX E

RECLAMATION PLAN

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1.0 INTRODUCTION

Crown Resources Corporation (Crown) proposes to develop an underground gold mine on Buckhorn Mountain approximately 3.5 air miles east of Chesaw, Washington with a satellite milling facility 2 miles south of Chesaw. The majority of the project will be developed on private land with some minor facility components and access roads on public lands. The public lands include lands administered by the U.S. Forest Service (USFS) Okanogan National Forest (Tonasket Ranger District) and the Department of Natural Resources, (DNR) Washington (Figure 1). This plan presents reclamation activities for final mine closure at the Buckhorn Mt. Mine Project.

Crown will reclaim disturbance where conditions and current reclamation technology permit. Historic and current land uses include hunting, gathering, mineral exploration and extraction, logging, agriculture, residential development, timber sale, firewood gathering, grazing, and recreation. The private land at the mill/TDF site has been dominantly used for agriculture and, in recent years, investment properties for home sites. Management of the USFS land is guided by a land and resource management plan (RMP) developed by the USFS (USFS 1989). The proposed mine plan is consistent with the goals and objectives of the USFS RMP as amended by the Spokane Resource Management Plan Record of Decision (ROD) (BLM 1987). The ROD states that all operations associated with mining development shall adhere to 43 CFR 3809 and 3802 which requires reclamation of all mining operations and compliance to air and water quality state and federal standards. The goal of reclamation is to return the site to a productive post-mining condition following closure and decommissioning.

Reclamation plans with regard to mining activities are discussed below as they pertain to road building, concurrent reclamation, interim reclamation, and final reclamation of the disturbed areas. Reclamation plans presented here are, to the extent applicable and appropriate, based on recommendations contained in the BLM Solid Minerals Reclamation Handbook (BLM 1992).

Water quality protection will be effective through the use of appropriate best management practices (BMPs) for control of erosion, sediment transport and sediment collection, and by the revegetation of the majority of disturbed surfaces.

Reclamation will be completed on both private and public lands. Key facilities to be reclaimed include:

- Mine portal and ventilation areas
- Mill/TDF and ancillary facilities area
- Access roads
- Power line corridors
- Monitor wells

The area surrounding the proposed mine supports forest plant communities typically found in north central Washington. Almost all of the area immediately surrounding the mine site has been disturbed by historical timber harvesting and drill road construction. Many of the drill roads have been recently recontoured and reseeded and are currently being monitored for vegetative success.

The surface reclamation of the mine site area of disturbance will entail plugging of the primary portal, the ventilation portal and the ventilation shaft followed by final recontouring and revegetation. The reclamation species mix will provide soil stabilization and erosion protection until the site is recolonized through natural invasion from surrounding timber stands. The vegetation in the mine area is described by Bio-Resources, Inc. (1995), and A.G. Crook (1992 and 1993), as largely consisting of the following plant associations:

- *Pseudotsuga menziesii* (Douglas-fir)/*Physocarpus malvaceus* (Ninebark)
- *Abies lasiocarpa* (Subalpine fir)/*Linnaea borealis* (Twin-flower)
- *Pseudotsuga menziesii* (Douglas-fir)/*Calamagrostis rubescens* (Pinegrass).
- It is expected that planting the above listed plant associations at the mine site will return it to those communities which the general area currently supports.
- Vegetation within the mill/TDF site consists of lowland grasses with sparse Ponderosa Pine and local stands of Douglas Fir in the lower areas.

In order to be successful, in the most cost-effective manner, reclamation planning must be initiated during the mine facility design phase and must continue until the appropriate success criteria are achieved. The plan must be flexible enough to accommodate potential changes in the mining operation over time. The current mining plan is for minimal surface disturbance by the use of underground mining methodology and the underground disposal of waste rock for backfill material instead of surface disposal. Both cemented backfill and uncemented backfill will be placed in the mine during operation to minimize surface disturbance related to subsidence.

1.1 Post Mining Land Use

The post mining productive land uses for the mine site will be hunting and gathering, timber harvest, wildlife habitat, grazing, recreation, and mining. These proposed uses are consistent with the USFS RMP as amended by the Spokane Resource Management Plan Record of Decision (ROD) (BLM 1987). Post project use of the mill/TDF site may be grazing.

1.2 Reclamation Schedule

Reclamation activities will be scheduled to occur as soon as practical after the mining activities are completed, thus minimizing erosion on exposed surfaces and sediment contribution to surface waters. In general, reclamation will be timed to take advantage of optimal climatic conditions. Final grading, drainage, and sediment control establishment will occur over the late spring and summer months. Seedbeds will be prepared in later summer or early fall just prior to seeding. Seeding will be completed in mid-late fall in order to take advantage of winter and spring moisture. If seeding is not completed prior to the onset of winter, or if fall seeding is unsuccessful, early spring seeding could occur as an alternative. Isolated ecological islands will be created from restored and transplanted shrubs and trees. The remainder of the area will be reclaimed using the established seed mixture.

Many of the reclamation activities can not occur until near the time of final mine closure. Areas such as the underground workings and surface facilities will remain active until mine closure. However, during the anticipated life of the project, interim and concurrent reclamation will occur to reduce erosion and the potential for off-site degradation.

1.2.1 Interim Reclamation

Interim reclamation refers to reclamation efforts on lands disturbed during the course of the Mine that will be redisturbed during mining activities. These lands while not at final reclamation contours will not be redisturbed for a significant time period and therefore require interim stabilization. To reduce erosion and sedimentation during the life of the operations, disturbed areas will be temporarily revegetated. Topsoil will not be applied to temporarily revegetated areas. These areas will be broadcast seeded with an interim seed mixture. Mulch and fertilizer may be added if initial seeding is unsuccessful. The topsoil stockpiles, tailing pipeline berm and access road embankment will require interim reclamation.

1.2.2 Concurrent Reclamation

Concurrent reclamation refers to reclamation activities which can be carried on at the same time as ongoing mining activities. Concurrent reclamation can be advantageously employed on disturbed areas that have served their purpose and are ready to be graded to final reclamation contours. Such areas will include:

- Disturbances associated with diversion ditches,
- Areas disturbed during construction of the tailings pipeline corridor,
- Any access roads that will not be needed for future activities.

Tree and scrub seedlings will not be planted along the roadways out slope disturbances. Natural re-establishment of trees and shrubs should be adequate to meet revegetation standards within the long, narrow corridors. Voluntary woody species reinvasion will be monitored through the active mining period. If woody species density is not adequate to meet the standards, additional shrub and tree seedlings will be planted along the corridors.

Where possible during the life of the project, disturbed lands will be reclaimed during ongoing mining operations.

1.2.3 Temporary Closure

Although the proposed project will operate year-round, it is possible that conditions may be encountered during the life of the project that may require temporary shutdown of the operations. The primary concern during a temporary closure will be maintenance of the water control structures.

The temporary closure plan is based on an economic shutdown of more than one year duration but not to exceed two or three years. The following steps will be followed to ensure that the closure and subsequent restart activities will be accomplished in a timely and environmentally safe manner:

- In the event of a temporary shutdown planned for more than one year, the appropriate regulatory officials in the USFS and Washington DOE will be promptly notified.
- Inventories of petroleum products, explosive and other potentially hazardous supplies that will not be used during shutdown will be used at other sites, returned to suppliers, or disposed of in compliance to the appropriate regulations.
- Concurrent reclamation will be implemented on areas not scheduled for additional disturbance.
- Crown personnel will regularly inspect on-site shutdown monitoring and maintenance activities which will include:
 - Maintaining access roads to all project facilities and monitoring locations.
 - Diversion ditches and infiltration ponds will be inspected annually in the fall to ensure that spring runoff can be handled and that the systems continue to function properly after major storm events. Maintenance will be performed as necessary.
 - Appropriate sediment control measures will be implemented as necessary to control erosion from disturbed areas which cannot be finally reclaimed.
 - Security and fire patrol of the facilities.
- Appropriate monitoring inspection reports will be completed and submitted to appropriate state and federal regulatory agencies during the temporary closure period as required.

1.2.4 Final Reclamation

Most reclamation activities will take place at the time of mine closure and will be considered “final” reclamation. The areas to undergo reclamation at mine closure include:

- The portal and ventilation areas,
- The final tailings embankment face,
- The sediment control ponds,
- Access roads and any drill pads which will be needed until mining ceases, and
- Mill/TDF and reclaims pond sites and associated areas of disturbance.

Final reclamation will be implemented upon the completion of mining and exploration. Final reclamation procedures are discussed below in detail.

2.0 GENERAL RECLAMATION PROCEDURES

This section includes the general steps to be followed in reclaiming each of the disturbance areas.

2.1 Soil Management

Crown recognizes that soil resources, particularly topsoil materials, is a critical component of the revegetation plan and will enhance and speed recovery of the disturbed areas a valuable resource at the site. Soil horizons will be stripped immediately following vegetation clearing from facility sites prior to construction. This action will assure viable, handling and stockpiling of those soils will be completed to allow microbial activity upon redistribution to the degree practical. Soil stockpiles will be reseeded with noxious weed-free mixed cover vegetation with an emphasis on the ability to root quickly and contain native species.

Soil is defined as the A horizon within the soil solum. The A horizon is the mineral horizon containing an accumulation of organic matter that has lost clay, iron, or aluminum with resulting concentrations of quartz or other resistant minerals of sand and silt size. The A horizon will normally sustain plant growth. Subsoil is defined as the B and/or C horizon within the soil solum. The B horizon is characterized by the accumulation of clay, iron, aluminum, and humus. The C horizon is the mineral soil horizon, excluding bedrock, which has weathered outside the zone of major biological activity (Buol, et al. 1981). Soil and subsoil will be used as plant growth medium for final and concurrent reclamation.

Topsoil is defined as the soil of the A and B horizons or referred to as all solum materials that will sustain plant growth. Topsoil will be used to facilitate revegetation of areas disturbed by the mining operation.

All soil and subsoil that can be practicably salvaged will be salvaged during land clearing activities. During construction or upgrading of roads, site preparation for the mine, tailings pipeline, sediment control structures, freshwater pond, mill area and parking lot, and tailing disposal and reclaim area excavation, the plant growth soil layer will be windrowed adjacent to the disturbed area or stockpile in strategic locations for visual shielding. The soil will be reclaimed on an interim basis, and retained for replacement and revegetation at the time of final reclamation.

2.2 Fertilization

Soil fertilizer will provide an initial source of nutrients for establishment of the various desired plant communities. Fertilization will also provide a source of nutrients for the development of microbial communities which will ultimately perpetuate nutrient cycling and soil development. The objective of soil fertilization is to provide a short-term nutrient supply to promote the establishment and growth of desirable plant species. Subsequently long-term nutrient requirements will be satisfied through the development of natural nutrient cycling and plant communities that are not fertilizer dependent.

Fertilization, particularly introduction of high nitrogen levels, may promote the invasion of weedy species. Native species are generally adapted to low levels of available nutrients. General fertilization guidelines will be used to evaluate the nutrient status of the material. Prior to topsoil placement, the stockpiled materials will be tested for available nutrients to verify that vegetation can be established without fertilization. If testing indicates that the soil does not have sufficient nutrients to maintain vegetation then the soil will be amended with fertilizer in order to facilitate the establishment of seeded species. If fertilizer is required, care will be taken to avoid the establishment of a plant community which is dependent on high nutrient levels.

2.3 Cultural Treatments

Cultural treatments typically refer to soil-modification practices that create more favorable conditions to facilitate plant growth by:

- Initiating and maintaining a stable soil system;
- Reducing erosion of surface soils;
- Increasing soil moisture and reducing evaporative losses;
- Extending the season of seeding and moderating local microclimates; and,
- Modifying microenvironments to create a more diverse plant community.

Typical cultural treatments that can be used to facilitate plant community development include soil ripping, tilling, harrowing, seedbed preparation, mulching, and erosion control measures. All mine

units which are compacted (i.e., roads, level surfaces on waste rock disposal areas, and surface facilities), will be deep ripped with bulldozer-mounted ripper bars or a chisel plow to a depth of 12 to 18 inches to loosen the plant rooting zone, create an adhesive surface for the topsoil application, and incorporate fertilizer materials. Deep ripping will increase infiltration by decreasing the bulk density, thus reducing run-off and erosion from the reclaimed slopes. Scarification (shallow ripping to 8 to 10 inches) will be conducted on mine units which do not have deep subsoil compaction. Ripping on all reclaimed slopes will occur parallel to the contours where possible. Ripping increases soil infiltration rates, soil water holding capacity and root permeability, thereby facilitating the establishment of perennial vegetation. On steeper slopes that have subsoil compaction, ripping will occur perpendicular to the contours and a chain drag will be attached behind the ripper to eliminate furrows. This will reduce erosion due to channelized flow. Topsoil application on slopes will result in a loose soil surface that is a receptive seed germination environment.

2.4 Erosion and Sediment Control

Long-term erosion control will be achieved by revegetating exposed soils as quickly as possible and to the maximum extent practical. Short-term erosion will be accomplished during mine operation by diverting surface water through diversion channels to infiltration ponds thereby eliminating excessive sediment transport from disturbed areas. Sediment control structures will be placed as necessary in ditches and below unvegetated slopes to aid erosion and sediment control. Culverts will be used to convey flow beneath access and haul roads. Catchment ditches will control storm water flow originating on the sites themselves. Storm water will be directed through sediment control structures and traps that will be designed to detain flows originating from disturbed surfaces to allow sedimentation to occur behind the structures prior to infiltration into specially designed infiltration structures.

Figures 2 and 3 show the locations of diversion ditches, sediment traps, and the flow direction of diverted waters at the mine and mill/TDF sites, respectively.

Sedimentation ponds will be monitored at least once per month during the summer months and weekly during spring snowmelt and as necessary following large precipitation events. Sedimentation ponds will be cleaned as necessary using a backhoe. Sediment removed from the ponds will be added to the topsoil stockpiles.

Sediment controls and diversion channels will be constructed and made fully operational prior to beginning other surface disturbance activities. Hay bales, silt fences, matting, and other sediment management practices will be used as necessary to aid in erosion and sediment control. Only hay that is certified noxious-weed-free will be used in order to reduce the potential for establishment of invasive species. Erosion and sediment control measures also include soil handling and grading techniques to enhance stability and reduce sedimentation, and revegetation practices to provide soil stabilizing vegetation cover adequate to minimize erosion.

Measures to control runoff and sediment transport during operations and until vegetation has been successfully established include the following:

- The disturbed area will be kept to a minimum at any given time through interim and concurrent reclamation.
- Drainage structures constructed on access and haul roads will include properly installed channels with appropriate BMP's such as, water-bars, cross drains, culverts, sediment traps and silt fencing.
- Management practices such as check dams, dispersion terraces, and filter fences will be used during construction and operations.
- Rapidly developing and sod-forming plant species may be included in the seed mixture to provide rapid stabilization.
- Topsoil redistribution and revegetation will occur in the first appropriate season after cessation of mining.
- Mulch (and tackifiers on hydroseeded areas) will be applied to aid in erosion control and moisture retention as necessary. It is anticipated that mulch will be applied to topsoil stockpiles and slopes steeper than 2H:1V.
- Revegetated areas will be protected from disturbance by placing signs and barriers to restrict traffic until vegetation is established.
- Interim revegetation will be used to stabilize topsoil stockpiles.
- Roads and water control structures will be maintained periodically as needed.
- Grading during reclamation will be designed and conducted to minimize the potential for erosion. Specifically:

- Reclaimed slopes will be inspected periodically. Any rills and gullies that develop will be stabilized and revegetated by backfilling, hand compacting and seeding with the interim seed mixture.
- Fill slopes and other potential sediment sources will be visually inspected throughout the operation to allow early detection of erosion and vegetation problems. During critical runoff periods such as spring snowmelt, inspection of some layer fills and erosive areas will be on a more frequent basis.
- Road grades have been designed such that natural drainage patterns are disrupted as little as possible.

2.5 Grading and Stabilization

Slopes will be shaped for reclamation upon completion of the active life of each project component. Depending on the type of material, erodibility, and the practical considerations of the mining process, overall slope grades will vary. Grading will be accomplished using bulldozers, or as directed by the agencies, a backhoe.

Loose faces of slopes which are accessible will be "walked" with a dozer to partially compact the surfaces prior to topsoil placement. Haul and access roads to be reclaimed will be graded or have the edge berm pulled back prior to revegetation. In addition, compacted surfaces, such as roads, parking areas and building areas, will be ripped or scarified as discussed in Section 2.3, prior to topsoil placement and revegetation.

2.6 Revegetation

2.6.1 Topsoil Application

Prior to topsoil replacement, composite samples will be taken from each stockpile. The samples will be analyzed for texture, organic material, pH, available macro-nutrients and available micro-nutrients. Topsoil will be placed on all reclaimed areas to provide growth medium for revegetation.

2.6.2 Species Selection

The selection of appropriate grass and forb species for revegetation and appropriate sources of plant materials is a critical process which controls the function of the overall revegetation program. All species included in the proposed seed mixtures will be adapted to the area. Species selection is based on proposed land use, climate, and soil conditions. Species selection will be reviewed by the USFS or DNR prior to final revegetation. For USFS property it is proposed that the vegetation mix, including trees, shrubs, forbs and graminoids will conform substantially to Table 3.4-1B proposed in the Final Reclamation Plan of the Plan of Operations for the Crown Jewel Project (BMG 1996). Specific seed sources will be selected to ensure that the plants are adapted to the elevation, precipitation, temperature, and soil conditions present at the Buckhorn Sites. Additionally, all disturbed areas at the mine site will have native tree and shrub transplants and seedlings planted.

The species mixture chosen for revegetation is designed to provide a stable environment that will be capable of supporting pre-mining land uses. All species selected for revegetation at the site will be adapted to low fertility environments. Species that are adapted to low nutrient conditions are better suited to compete with aggressive weedy species during the critical plant establishment period. The utilization of adapted species and careful fertilization techniques will ultimately result in a plant community composed of species that can survive lower nutrient conditions, yet out-compete aggressive weedy invaders that require higher nutrient conditions. Seeds are available from suppliers in Washington State and seedlings from suppliers in the Pacific Northwest who specialize in reclamation. Crown will obtain seeds from established seed supply companies which produce seed adapted to the conditions (elevation range of 3,000 to 5,000 ft MSL and average annual precipitation of 13 to 25 inches) at the Buckhorn Mt. sites. If appropriate seed sources are not available, with adequate lead time, most seed distributors will collect appropriate seed sources as required for a given revegetation request.

Data from the BioResources (1995) vegetation survey were used to develop the following interim revegetation species list. Trees and shrubs will be planted where feasible, and an additional seed mixture of forbs and graminoids applied. A list of trees, shrubs, forbs, and graminoids species to be included in revegetation are included below. Also included are the planting or seed application rate.

Species Scientific Name	Common Name	Plant (Stem/ac)	Seed (lb PLS/ac)
Trees			
<i>Pseudotsuga menziesii</i>	Douglas-fir	162	
<i>Acer glabrum</i>	Douglas maple	65	
<i>Picea engelmannii</i>	Engelmann spruce	32	
<i>Abies lasiocarpa</i>	Subalpine fir	33	
<i>Larix occidentalis</i>	Western larch	33	
Shrubs			
<i>Pachistima myrsinites</i>	Pachistima	130	
<i>Linnaea borealis</i>	Twinflower	75	
<i>Arctostaphylos uva-ursi</i>	Kinnikinnik	45	
<i>Lonicera utahensis</i>	Utah honeysuckle	25	
<i>Chimaphila umbellata</i>	Pipsissewa	30	
<i>Spirea betulifolia</i>	Shiny-leaf spirea	30	
<i>Vaccinium membranaceum</i>	Big huckleberry	10	
<i>Physocarpus malvaceus</i>	Ninebark	40	
<i>Shepherdia canadensis</i>	Russet buffaloberry	5	
<i>Berberis</i>	Oregongrape	10	
Forbs			
<i>Fragaria spp.</i>	Strawberry		
<i>Antennaria racemosa</i>	Raceme pussytoes		
<i>Lupinus spp.</i>	Lupine		
<i>Achillea millefolium</i>	Yarrow		0.11
<i>Thalictrum spp.</i>	Meadowrue		
<i>Arnica cordifolia</i>	Heartleaf arnica		
<i>Clematis columbianum</i>	Rock clematis		
Forbs continued			
<i>Epilobium angustifolium</i>	Fireweed		0.04
<i>Hieracium albiflorum</i>	White hawkweed		
<i>Goodyera oblongifolia</i>	Western rattlesnake plantain		
<i>Pyrola secunda</i>	One-sided wintergreen		
<i>Smilacina racemosa</i>	Western solomonplume		
<i>Viola spp.</i>	Violet		
Graminoids			
<i>Calamagrostis rubescens</i>	Pinegrass		
<i>Carex spp.</i>	Carex		
<i>Festuca occidentalis</i>	Western fescue		
<i>Pseudoroegneria spicata</i>	Bluebunch wheatgrass		5.60
<i>Bromus vulgaris</i>	Columbia brome		
<i>Poa ampla/segunda</i>	Big bluegrass/Sandberg's bluegrass		0.80

Species are recommended because they are native to the Buckhorn Mt. area and will ultimately become the dominant herbaceous species on the revegetated areas. However, these species are slow

to colonize and therefore are not recommended for use alone in revegetation seed mixtures where erosion control is the overriding concern in the first year or two of growth. Therefore, species such as big bluegrass are included and provide excellent forage and is popular with upland game birds as nesting habitat. Bluebunch wheatgrass is a cool season sod forming grass which will provide erosion protection in the early stages of revegetation.

At least 15 percent of the species mix selected to provide immediate soil stabilization during reclamation will be species with higher palatability to wildlife.

Seed mixes for the mill/TDF site will be developed with the assistance and approval of the DNR for application after recontouring.

2.6.3 Seeding and Planting

If possible, all seeding and planting activities will be conducted in the fall at the conclusion of regrading, placement of topsoil, fertilization, and seedbed preparation. Seeding is most effective when completed prior to the period of peak precipitation. If fall seeding is unsuccessful, areas will be re-seeded in the spring. Tree and shrub seedlings will be planted in the fall and late winter/early spring to take advantage of soil moisture conditions.

Seedbed preparation will be accomplished using rippers on the contour when feasible. The surface of the prepared seedbed will be left relatively rough to create microsites to facilitate burial of seed and establishment of seedlings. Seed will be broadcast with a cyclone-type broadcaster on accessible sites and by means of hand broadcasting on steep slopes. The seedbed will be harrowed or dragged following seeding to ensure proper seed burial. Broadcast seeding techniques will be used on all disturbed areas to create a more natural-appearing plant community. Broadcast seeding disperses seed over the soil surface in a random pattern. This provides a more natural-appearing plant community than drill seeding, which plants seeds in straight lines at fixed intervals.

If possible, planting will take place in the fall to take advantage of late-fall and spring precipitation. If fall planting is not possible, seedlings will be planted in the spring as soon after snowmelt as practical.

2.6.4 Mulch Application and Surface Stabilization

Mulch may be applied as needed to seeded areas immediately after seeding to facilitate plant-community development and to protect the seeded areas from wind and water erosion until the plants have become established and stabilized the soil. Mulch provides a favorable plant growth environment by maintaining effective soil temperatures to enhance germination, and by conserving moisture in the soil profile for plant use. Areas which are difficult to reclaim may be mulched to facilitate plant establishment.

Reseeded sloped surfaces are to be mulched with either wood-fiber hydromulch or straw mulch at a rate sufficient to preclude erosion and provide a suitable environment for plant establishment. If wood-fiber hydromulch is used, tackifier may be added to assist in erosion control. Certain areas may be stabilized with erosion control blankets, if necessary. Level or nearly-level surfaces will be mulched with straw. The mulch will be crimped into the soil surface if soil conditions, slope steepness, and coarse woody debris do not impede the use of a straw crimper. Mulch will be certified noxious weed-free.

3.0 RECLAMATION OF DRILL SITES/ROADS

Extensive reclamation related to previous drilling has already been completed and is ongoing at the mine site. Exploration drilling roads constructed by Crown and, more extensively by BMG, were reclaimed by BMG (now Newmont Mining) in 2002 and 2003. Revegetation is currently being monitored.

Reclamation of the Buckhorn drill sites and access roads will be performed incrementally. A small amount of road area to be needed for access to ongoing monitoring and/or mining activities will not be reclaimed until those activities are completed. However, adequate drainage patterns and erosion control berms and water bars will be retained on these unreclaimed areas so as to avoid formation of erosion rills or gullies.

3.1 Slash Clearing and Topsoil Stripping and Salvaging

Should future exploration be required the activities would be permitted as were previous programs. Crown will use as many open areas as possible in order to minimize the disturbance to mature trees.

Any slash will be isolated, piled, and left in place for establishment of microenvironments for rodents and small mammals. Where practical topsoil (growth medium) will be stripped from areas of the roads and drill pads and stored in small stockpiles adjacent to each pad site or as sidecast along roadways. In areas where topsoil is to remain in storage for a period exceeding six months, the stockpiles will be seeded with the temporary seed mixture.

3.2 Drill Pads and Road Reclamation

Recontouring of drill pads to approximately pre-disturbance contours will be done to the extent possible at all Buckhorn sites whether on federal, state or private land. Many of the sites in flatter terrain will not require recontouring but may require topsoil addition. In areas of moderate slopes, recontouring can be accomplished by salvaging sidecast deposited during road construction. In areas of very steep slopes, some additional material will necessarily be imported in order to recontour.

Recontouring procedures for drill roads with cuts will be determined by the steepness of slopes, height of cuts and size of sidecast. On gentler slopes, where roads occur in unconsolidated material, a bulldozer will be used along contour to reshape cuts by pushing up sidecast material. In areas of moderate slope, a track-mounted excavator with a 16-foot reach will be used along contour to pull up sidecast prior to reshaping with the cat. In areas too steep for sidehill operations of the cat, the excavator will place the material and compact it using the bucket. In all areas on federal land a backhoe is proposed for use for recontouring regardless of grade.

Revegetation will use the seed mix presented in Section 2.6.2. Seeding will take place in the fall immediately following topsoil placement. The surfaces will be broadcast seeded, planted and mulched using the techniques described in Sections 2.6.3 and 2.6.4.

3.3 Drill Hole Abandonment

Completed exploration drill holes and monitor wells on private land are and will be abandoned during reclamation using the methods specified by WAC 173-160 Minimum Standards for Construction and Maintenance of Wells. Prior to capping, all holes will be filled with a drill hole abandonment fluid consisting of a premium-grade bentonite mixed to a minimum of +50 viscosity. The surface casing will be pulled or cut off, and the top 20 feet of the hole will be cemented. If artesian water is encountered in a hole, that hole will be cemented from bottom (T.D.) to top (the collar).

Drill holes located on federal land will be reclaimed according to procedures in the BLM Solid Minerals Reclamation Handbook.

Accessible drill holes which intersect underground workings during exploration and production will be cemented if they promote an inflow of water.

4.0 RECLAMATION OF INDIVIDUAL PROJECT COMPONENTS

The following section discusses the steps to be taken in the closure and revegetation of each project facility.

4.1 Mill Site, Administration Area and Ancillary Facilities Area

Surface organic soils will be salvaged and stockpiled from the disturbance areas of the plant site prior to building pad construction. Upon decommissioning, stockpiled topsoil will be redistributed on the various sites prior to revegetation. The stockpiles will have been seeded with the approved seed mix to provide interim reclamation. Upon final closure, the plant will be decontaminated by flushing, rinsing, or cleaning any components that come in contact with process solutions or chemicals. All processing equipment and chemicals within the buildings will be removed from the site for salvage value. A decision will be made within the last year of operations as to the disposition of the process plant building. It is currently anticipated that the building will be dismantled and removed from the site for salvage value. Surface fuel and oil storage tanks used on-site will be removed.

The concrete foundations of any buildings which are removed, and the concrete pads used for storage tank containment will be broken up and buried in place to a depth of at least two feet in accordance with WAC 173-304 Minimum Functional Standards for Solid Waste Handling. Prior to placing topsoil, the surface will be ripped using a dozer-mounted ripper bar to a depth of 12 to 18 inches to alleviate compaction and increase infiltration, thus reducing runoff and erosion, providing available moisture for plant roots and providing a roughened contact surface for applied topsoil. Topsoil will be placed at a depth of approximately 8 inches. Topsoil will be re-spread using a bulldozer. Following topsoil placement, the surface will be shallow-ripped to a depth of approximately eight inches using a chisel plow. This will create a roughened surface which provides a protected microenvironment to aid in vegetation establishment. The pads of any buildings that are removed will be recontoured to be free draining and blend into the surrounding topography. The surface facilities of the sewerage septic system, if present, will be removed. All excavations will be back filled or recontoured to restore free drainage and blend into the surrounding topography. Any disturbed areas that remain following the disposition of the buildings will be covered with salvaged soil and revegetated as described in Section 2.6.2.

4.2 Underground Workings

Access to the underground mine will be via an adit. The adit will be located above the groundwater elevation and is a decline into the mine levels. Upon ultimate closure of the site, the adit will be plugged, recontoured, and revegetated. The cut face of the entrance to the adit will be partially backfilled and recontoured. Plugging the adit will be accomplished to the guidelines specified in the BLM Reclamation Handbook. The mine workings will be closed by installing a permanent bulkhead at a point above the groundwater level and allowing the workings to flood. It is anticipated that no discharge will emanate from the adit entrance due to the phreatic level being at a lower elevation than the portal opening. Flooding of the majority of the workings will minimize oxidation of sulfide bearing material, prevent acid drainage, and provide additional resistance to potential subsidence. Prior to flooding, all equipment, which may have an adverse affect on groundwater quality, and any materials which are contaminated with oil or grease will be removed from the mine and placed in the tailing disposal facility, land farmed and bioremediated or transported to an appropriate disposal facility.

The backfilling of the entrance to the adit will prevent access to the workings, and will be contoured to integrate with the surrounding topography.

During mining, voids produced will be selectively backfilled following completion of stoping. The use of cemented backfill (glacial gravels) or uncemented backfill (development rock or gravel) will be determined based on the requirement for stope stability depending on stope geometry, size, depth from surface, and mine sequencing. Backfilling will be the primary means of preventing subsidence of the rock overlying the stopes. This will serve the dual purpose of preventing surface damage caused by subsidence and minimize flow into the workings by preventing fractures caused by subsidence.

The ventilation raise at mine closure will be permanently capped. The cap will be designed to prevent subsidence at the surface even in the event of collapse of the raise walls. The cap will be constructed of reinforced concrete. The ventilation adit will be reclaimed as described above for the main adit.

4.3 Tailings Disposal Facility

The TDF has been designed with a geomembrane composite liner system for permanent disposal of the detoxified mill tailings. The TDF is designed to contain approximately four million tons. The design provides for embankment downstream slopes of 2.0(H):1(V). The TDF crest width has been designed at 18 feet. The TDF and mill site location in Dry Gulch contains no effective upgradient surface water catchment which minimizes the potential for upgradient runoff. The highly permeable nature of the glacial gravels underlying the site further minimizes the potential for upgradient surface water flow. A catchment is designed to divert surface flow from the face of the embankment to an infiltration pond downgradient of the TDF. The preliminary design provides for a maximum embankment height of approximately 145 feet. The tailings placement will be managed by multiple discharge points around the impoundment to control the topography and open water pond location. Active management of the tailings deposition will allow the operators to create a final tailings surface configuration to facilitate reclamation and surface water flow towards a reclamation spillway without significant grading or structural fill.

The reclamation of the tailings disposal facility will include six elements, in the approximate order listed below:

- Continued circulation of overdrain fluids to enhance evaporation of pond fluid
- Reclamation of the embankments
- Tailings deposition during the last stages of operation will be managed to provide surface drainage towards a reclamation spillway, with minimal recontouring
- Coarse material layer placement
- Soil placement
- Revegetation of the disposal area surface
- Construction of the reclamation spillway

After reclamation, the overdrain located immediately beneath the deposited tailings on top of the liner system will continue to collect tailings solution as the tailings consolidate. The solution will be

conveyed to the reclaim pond for evaporation, passive treatment, or removal for offsite treatment. The overdrain flow will continue for a number of years after reclamation at a very low flow rate, requiring maintenance activities.

4.3.1 Tailings Embankment

The tailings embankment will be reclaimed upon completion of the final raise or, alternatively, upon completion of facility operation. Soil will be redistributed, fertilized (if necessary), and the area seeded and mulched as discussed in Sections 3.9, 3.10, and 3.12, respectively. The embankments will be reclaimed at the constructed outslopes of 2H:1V. Some regrading of the embankments will be performed during reclamation to eliminate excess embankment height and to smooth the crest and corners of the embankments, so that they blend with the surrounding topography. The tailings embankment will be reclaimed in accordance with the Dam Safety Permit requirements.

At the conclusion of tailings deposition, the embankment inside slopes will have synthetic liner exposed. Reclamation of these slopes will include excavation of a shallow trench on the tailings surface at the toe of the slope, folding the synthetic liner to the bottom of the trench and covering it with the excavated tailings, to a depth of approximately 3 ft.

The portions of the embankments above the tailings surface will be graded down to the level of the tailings surface following reclamation.

4.3.2 Tailings Disposal Facility Surface

During the last year of tailings placement, the depositional sequence will be modified by depositing tailings through selected lines and spigots in areas necessary to achieve the final tailings surface configuration. The reclaimed surface will be gently sloped to promote overall drainage to a reclamation spillway. Only minor grading of the tailings is expected to be required after cessation of tailings placement. The reclaimed surface will gently slope toward the spillway. The surface will be non-erosive at this gentle slope.

The volume of tailings water in the system will be reduced to the minimum possible during the last phase of operations. Water will be reduced by limiting the addition of make-up water and, if

necessary, spray evaporation of ponded water within the tailings area. By reducing the system water, the free water pool area can be minimized and immediate access to a large portion of the disposal area will be possible at closure.

As the remaining areas of the tailings consolidate, equipment will have access to the facility for placement of coarse material and soil. The amount of time required to allow access to the pond area by reclamation equipment will depend on the season and climatic conditions at the completion of operations. However, by using the thin-layer deposition method for tailings disposal and the use of an overdrain, the tailings are expected to dewater quickly and allow reclamation of the surface to be completed within 1 year of the cessation of deposition.

A “store and release” type reclamation cover is planned to minimize infiltration and promote vegetation. The specific cover details will be developed based on infiltration modeling but it is anticipated that the cover would consist of a monolithic layer of soil ranging from 18 to 36 inches in thickness. The cover will contain moisture retaining soil that during the wet times of the year will hold the moisture for evapotranspiration thus preventing deep infiltration of precipitation into the tailings. Analysis will be performed during the design phase to determine whether a capillary break will be required to prevent wicking of tailing moisture up into the soil cover. The reclamation cover area will be fertilized (if necessary), and the area seeded and mulched. Riparian vegetation will be planted in the small detention pond area anticipated to be adjacent to the spillway.

Following reclamation of the tailings surface there will be no long-term retention or ponding of runoff from precipitation events. The surface grade will further minimize the infiltration of precipitation and runoff will occur during precipitation events.

4.3.3 Reclamation Spillway

During reclamation, a permanent spillway channel will be constructed through the embankment or within the adjacent native soils to allow stormwater flow from the reclaimed surface. Erosion protection will be employed to convey the design storm event. The details of the reclamation spillway will be included in the Dam Safety Permit Application.

4.3.4 Tailings Slurry Pipeline

The tailings slurry pipeline will be salvaged (decommissioned and removed from the site) at facility closure. Following the removal of the pipeline, the liner will be removed and the ditch filled in with sidecast material. The area will be covered with topsoil sidecast at construction and revegetated.

4.3.5 Tailings Recovery Solution Transfer Channel

Reclamation of the tailings recovery solution transfer channel and return piping system will begin after the cessation of ore processing. The pipelines will be removed from the site for sale or reuse. The liner will be removed from the site and recycled or disposed. Soil will be replaced and the channel area will be revegetated in the same manner as the diversion ditches.

4.3.6 Reclaim Pond

The Reclaim Pond (RP) is designed to collect waters from the overdrain system and the leak detection and collection systems of the TDF.

The RP will collect flows from the overdrain and, if a leak occurs from the leak detection and collection systems, during operations. Monitoring of the quality and quantity of these flows will occur throughout operations. If monitoring indicates unacceptable water quality in the underdrain, this water will also be routed to the RP. Details of the monitoring plan will be included in the application for a State Waste Discharge permit, which will be submitted to the Washington Department of Ecology (WDOE). During tailings reclamation activities, these flows will be recirculated and evaporated, through spraying if necessary, within the TDF.

As the tailings consolidate and drain, flows to the RP will gradually diminish. Flow from the tailings at closure and post-closure of the facility will be estimated as part of the tailings design and closure plan. Flows from the drain layer will also be monitored for quantity and quality. Crown will evaluate and implement appropriate management options to ensure that flow meets all applicable water quality standards. These options may include passive treatment, evaporation, or offsite water treatment.

Any solids deposited within the RP will be sampled and analyzed for toxicity using U.S. EPA Method 1312 (USEPA 1995). If the solids indicate potentially toxic characteristics, they will be removed with the liner for disposal in an appropriate facility. If the solids do not indicate toxic characteristics, they will be left in place with the liner and buried. Native embankment material will be pushed in to fill the pond to approximate the surrounding topography. Native embankment material will be redistributed, fertilized (if necessary), and the area seeded and mulched. If a passive treatment system is constructed, then soil handling and revegetation techniques will be revised in accordance with treatment requirements.

4.4 Sediment Control Structures

At closure, the sediment pond embankments will be removed by grading into the pond area. The grading will be accomplished in a manner that restores the original drainage patterns. The disturbance associated with the sediment ponds will be revegetated as described in Section 2.6.2 and will comply with the storm water pollution prevention and erosion control plan.

4.5 Fresh Water Pond

At closure, the fresh water pond will be recontoured by grading into the pond area. The disturbance associated with the fresh water pond will be covered with topsoil and revegetated as described in Section 2.6.2 and will comply with the storm water pollution prevention and erosion control plan.

4.6 Roads

As soon as practical after new road construction or road upgrading, cut-and-fill slopes will be reclaimed on an interim basis as described in Section 2.6.2.

Crown will work with the USFS to determine which roads on USFS land should be left open after reclamation. Roads which will be removed will be ripped to a depth of 12 to 18 inches to reduce compaction. If necessary, heavily compacted portions of roads will be ripped twice. Minor regrading will be conducted to achieve approximate pre-mining contours. Soil will be redistributed, fertilized (if necessary), and the area seeded and mulched as discussed in Sections 2.6.2 and 2.6.3.

Roads with significant cut or fill will be ripped and the road bed material will be recontoured to blend with the surrounding areas. This will be accomplished by a dozer on slopes flatter than 2.5H:1V or a hydraulic excavator, gradall, or backhoe on steeper sideslopes. Reclaimed road surfaces will be stabilized using erosion control BMP's, such as diversion channels, terraces and/or water bars as necessary. Soil will be redistributed, fertilized, if necessary, and the area seeded and mulched as discussed in Sections 2.6.2 and 2.6.3. Reclaimed roads which could experience continued use after reclamation will be blocked with earth or rock berms to eliminate vehicular access.

4.7 Power Lines and Fencing

At the completion of mining activities, any power poles and lines on the mine site or the mill/TDF site will be removed. Power lines providing electricity to the sites will be reclaimed according to the instructions of the PUD. All surface disturbances related to these removal activities will be regraded and seeded and/or planted with the appropriate mixture, depending on the location. Compacted areas resulting from pole removal will be ripped and revegetated.

Fencing at the mine and mill sites will be removed when reclamation is complete and revegetation is established.

5.0 POST CLOSURE MONITORING PLAN

Reclamation performance monitoring will begin either during operations or during the first growing season after reclamation operations have been completed for a reclaimed segment. Monitoring will continue until successful reclamation is achieved on all areas directly disturbed by mining operations and reclaimed. Monitoring at closure and through reclamation will focus on water quality protection, noxious weed control, erosion control, slope stability, and revegetation.

During the period of monitoring Crown will submit an annual report to the USFS, WDOE, and WDNR for the preceding calendar year. The annual report will contain descriptions of the reclamation activities completed during the previous year. The annual report will also include a summary of areas reclaimed and any corrective actions completed and/or proposed.

5.1 Subsidence

During mining, the stopewalls and the surface will be monitored for signs of subsidence. The voids produced during mining will be selectively backfilled after stoping is completed. Backfilling will prevent surface disturbance by minimizing subsidence of the rock immediately overlying the stopes. The results of monitoring will be used to determine the placement of backfill during operation.

5.2 Water Quality Monitoring

A Project Monitoring Plan will be developed to describe the operational monitoring of surface water, groundwater, and spring and seep monitoring during operations. The Plan will incorporate and synthesize monitoring requirements of all permits. Following closure and reclamation, some of the monitoring points and parameters to be analyzed may be revised or dropped based on the results of operational monitoring. Post closure monitoring programs will be developed in cooperation with the agencies prior to closure.

5.3 Geochemical Monitoring

The geochemical behavior of the rock to be mined and processed for the Buckhorn Mountain Project has been extensively characterized by BMG (Adrian Smith Consulting Inc. 1992; Kea Pacific 1993a,

1993b, 1993c; BMG 1993; BMG in association with Geochimica and Golder 1996; TerraMatrix 1995; and Geochimica 1996) and in the Crown Jewel FEIS (USFS and DOE 1997).

Humidity Cell Testing (HCT) results confirmed that only small portion of the waste rock materials will generate acid drainage. HCT results for the ore and tailings indicated that these materials are not acid generating. Consequently the potential for acid generation within the temporary development rock stockpiles is remote. Concurrent reclamation of the areas covered by these stockpiles will occur after all of the development rock backfill has been placed underground.

Backfilling which occurs during mining will provide assurance that the underground workings will not produce acid drainage. The neutralizing character of the wall rocks, the neutralizing backfilled development rock, the neutral glacial gravels and, particularly, the added cement, will ensure that a neutralizing environment will exist in the previous underground workings. To evaluate the effectiveness of these mitigative measures, water quality samples will be taken quarterly for a period of at least three years or as directed by the DOE. The samples will be tested at an approved laboratory for parameters established in the Washington State Waste Discharge Permit.

5.4 Noxious Weed Control Monitoring

Reclaimed areas will be monitored for the occurrence of noxious weeds. If noxious weeds are identified in revegetated areas Crown will implement weed control measures as discussed in Section 7.0.

5.5 Erosion Control Monitoring

Soil stability will be estimated for all reclaimed areas using the qualitative descriptors in the 1973 Determination of Erosion Condition Class Form 7310-12 (U.S. Department of the Interior). A qualified technician will observe each reclaimed area and assign one to the listed qualitative descriptors. The designations will be completed twice annually for erosion control purposes, once in the spring and once in the fall; and at year three for performance monitoring purposes. The monitoring results will be used to aid in determining the cause of any failures which are encountered and to locate problem areas before erosion becomes widespread enough to affect water quality. Areas

which have temporary erosion control BMPs, such as silt fencing and straw bales, will be monitored as described above. These BMPs will be removed when no longer essential for erosion control.

5.6 Revegetation Monitoring Plan

It is recommended that inspections be performed annually for three years during the peak of the growing season or until a satisfactory vegetative community has been established. Crown will monitor both the private land and USFS land and re-seed any areas where revegetation is not successful.

6.0 PUBLIC SAFETY

Various activities prior to and during the mine life and during closures will be performed to protect public safety. Safety measures to be used during mining operations are described in the POO.

Closure of the underground working will be accomplished by backfilling during operations and plugging the portal at closure. The voids produced during mining will be selectively backfilled after stoping is completed. Backfilling will prevent surface disturbance by minimizing subsidence of the rock immediately overlying the stopes and will provide stability in the workings during operation.

The ventilation shaft and portal will be closed by constructing blockages at the entrances and covering by backfilling to return the surfaces to approximate pre-mining contours.

7.0 NOXIOUS WEED CONTROL PLAN

Reclamation activities will take place as soon as possible after disturbance using a seed mixture that will include species that establish quickly. This will help prevent the establishment of noxious weed species. Commercially available certified noxious weed free species will be used in reclamation as much as possible. Minimizing the use of fertilization will also prevent the establishment of noxious weed species which prefer high nitrogen levels in soils. To this end, natural minimization of weeds will be attempted and exercised. However, in the event natural means are inadequate the noxious weed control plan will be initiated.

The noxious weed control plan will include the application of appropriate herbicides. Use of herbicides on federal land will be approved by the USFS. Herbicide technology for the control of weeds has developed rapidly in recent years, and is the most widely used means of removing noxious weeds from naturally-occurring plant communities. The use of herbicides has many advantages over other control methods such as biological, mechanical, and fire. These advantages include:

- Less expensive than most mechanical methods;
- Can be used on steep or rocky slopes where mechanical methods are not possible;
- Provides a selective means of killing certain weed species, such as root sprouters that cannot be efficiently controlled by other methods;
- Maintains grass and litter cover and does not expose soil to erosion;
- Provides rapid control; and,
- Is safer than fire.

The plant species proposed for revegetating all facilities include mixtures of grasses and forbs which will be developed in cooperation with the agencies or as described in Section 2.6.2. The herbicides which are proposed for controlling all noxious weeds that may invade revegetated areas are 2, 4-D, and Tordon. These herbicides, when properly applied, will not damage grasses, but will affect broadleaf plants such as forbs and shrubs. Annual weed inspections and treatments will keep establishment of these species to a minimum and provide adequate control. Crown will consult with

the Okanogan County Weed Board and the USFS (for Federal land) to determine the most appropriate herbicide.

Additional noxious weed control measures include:

- Perform concurrent and interim reclamation where possible.
- If available, use certified noxious-weed-free seeds.
- Establish perennial vegetation cover using seeding mixtures which include adapted native species.
- Straw and mulch used during mining activities for erosion control, sediment treatment, etc. will be certified noxious-weed free.
- Herbicide application will be conducted at a time of year that results in the most efficient use of herbicides and/or labor.
- All previously used equipment will be washed prior to arriving on site.

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FIGURES

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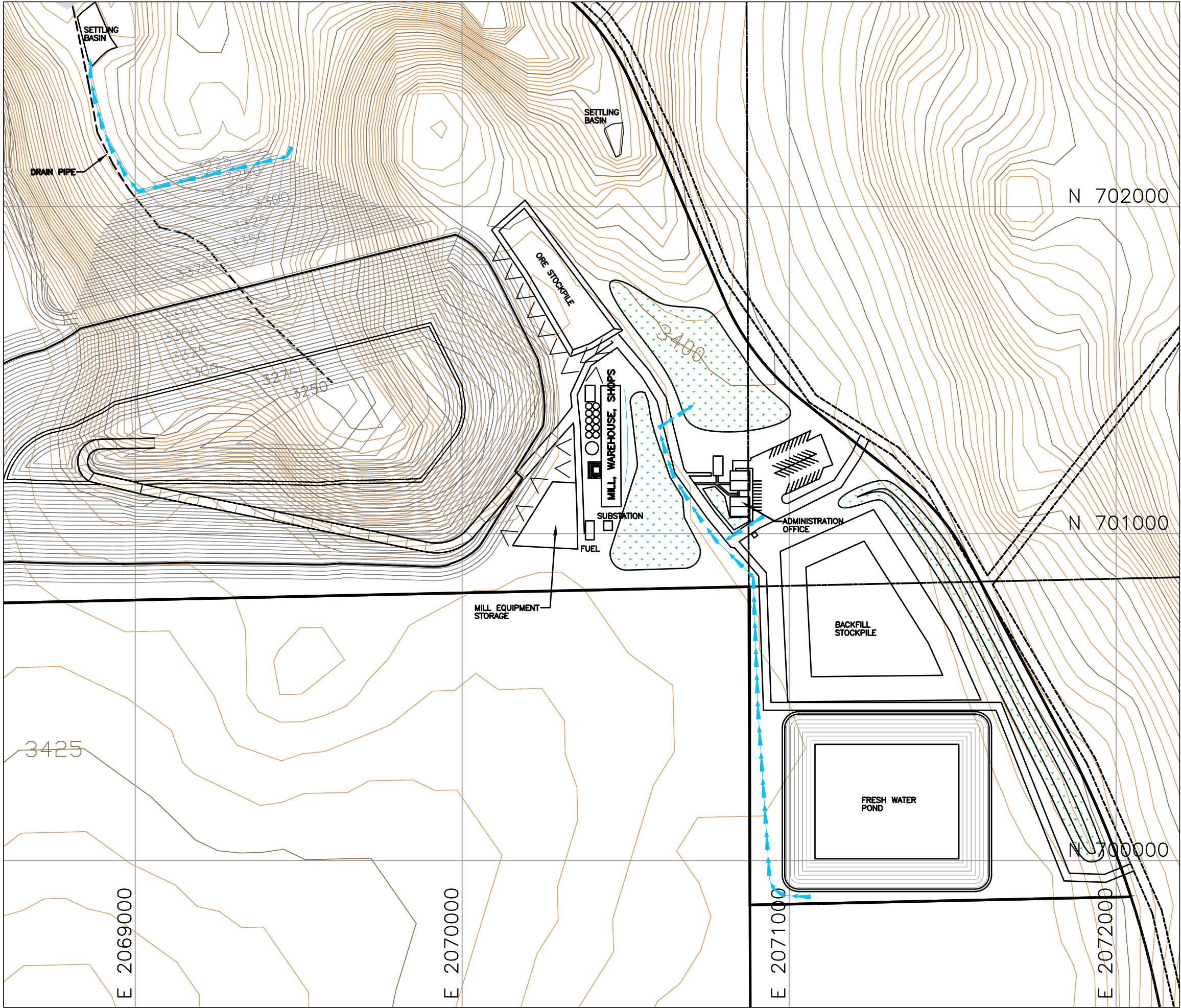
LEGEND

- BUCKHORN MINE SITE
- ROUTE FROM OROVILLE
- BUCKHORN MILL/TDF SITE

1" = 10000' Feet

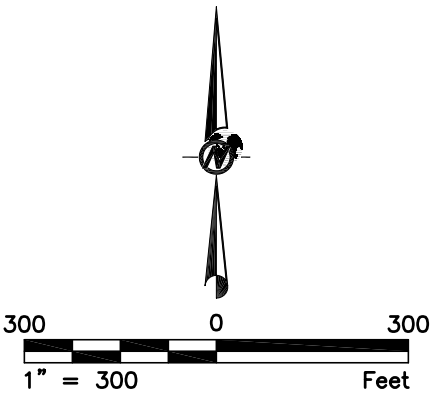
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	SCALE	AS SHOWN REV. A
FIGURE 1		


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LEGEND

- EXISTING GROUND CONTOURS
- 3390 PROPOSED IMPOUNDMENT CONTOURS
- EXISTING ROAD
- SECTION LINE
- SURFACE WATER DIVERSION CHANNELS WITH DIRECTION OF FLOW
- TOPSOIL STORAGE/VISUAL SCREENS
- PROPERTY LINE
- GRADED FOR POSITIVE DRAINAGE



PROJECT	BUCKHORN MOUNTAIN PROJECT OKANOGAN COUNTY, WASHINGTON		
TITLE	MILL SITE WITH SURFACE WATER DIVERSIONS		
 CROWN RESOURCES	FILE No.	0232002A036	
	SCALE	AS SHOWN	REV. A
FIGURE 3			